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AMERICAN

Natural History

BY

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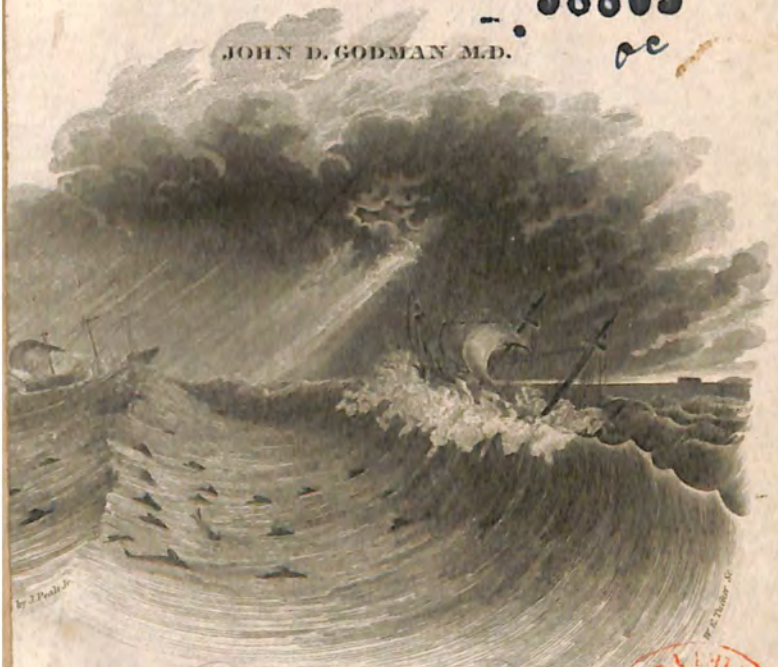
JOHN D. GODMAN M.D.



Philadelphia.

CAREY, LEA & CAREY CHESTNUT STREET

1828

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AMERICAN

NATURAL HISTORY.

VOLUME III.

PART I.—MASTOLOGY.

BY JOHN D. GODMAN, M.D.

PROFESSOR OF NATURAL HISTORY IN THE FRANKLIN INSTITUTE OF PENNSYLVANIA; ONE OF THE PROFESSORS OF THE PHILADELPHIA MUSEUM; MEMBER OF THE AMERICAN PHILOSOPHICAL SOCIETY; OF THE PHILADELPHIA ACADEMY OF NATURAL SCIENCES, &c.

PHILADELPHIA:
CAREY, LEA & CAREY—CHESTNUT STREET.

1828.

Eastern District of Pennsylvania, to wit:

BE IT REMEMBERED, That on the first day of February, in the fifty-second year of the Independence of the United States of America, A. D. 1828, P. H. Nicklin, of the said district, hath deposited in this office the title of a book, the right whereof he claims as proprietor, in the words following, to wit:

"American Natural History. Vol. III. Part I. Mastology. By John D. Godman, M. D. Professor of Natural History in the Franklin Institute of Pennsylvania; one of the Professors of the Philadelphia Museum; Member of the American Philosophical Society; of the Philadelphia Academy of Natural Sciences, &c.

In conformity to the Act of the Congress of the United States entitled, "An act for the Encouragement of Learning, by securing the copies of maps, charts, and books, to the authors and proprietors of such copies, during the times therein mentioned."—And also to the act, entitled, "An act supplementary to an act, entitled, "An act for the encouragement of learning, by securing the copies of maps, charts, and books, to the authors and proprietors of such copies during the times therein mentioned," and extending the benefits thereof to the arts of designing, engraving, and etching historical and other prints."

D. CALDWELL,

Clerk of the Eastern District of Pennsylvania.

AMERICAN

NATURAL HISTORY.

CHAPTER I.

Genus Ox; *Bos;* L.

Fr. Bœuf. *Germ.* Ochs.
Sp. Buly. *Ital.* Bove.

GENERIC CHARACTERS.

The head is large, having a straight outline; large ears and eyes; a large muzzle and long smooth tongue. The subocular sinuses do not exist. The body is of large size, supported upon strong legs. A fold of skin depends below the neck, called the dewlap. The tail is frequently long and terminates in a brush; in some species it is of a middling length. The horns are conical, smooth and simple, variously curved, though often turned laterally with the points upwards.

Dental System.

32 Teeth: { 12 Upper { 12 Molar
20 Lower { 8 Incisive
12 Molar.

Species I.—*The Bison.*

Bos Americanus Gmel.

Taurus Mexicanus: Hernand. Mex. 587. Tauri Vaccæque, Ibid. Anim. p. 10.
The Buffalo: Catesby, Carol. 28 tab. 20.
Bœuf Sauvage: Dupratz, Louisiane, ii. 66.
American Bull: Penn. Quad. pl. ii, fig. 2.

[*Commonly called Buffaloe.*]

From other species of the ox kind, the Bison is well distinguished by the following peculiarities. A long shaggy hair clothes the fore part of the body, forming a well marked beard beneath the lower jaw, and descending behind the knee in a tuft. This hair rises on the top of the head in a dense mass, nearly as high as the extremities of the horns. Over the forehead it is closely curled, and matted so thickly as to deaden the force of a rifle ball, which either rebounds, or lodges in the hair, merely causing the animal to shake his head as he heavily bounds along.

The head of the bison is large and ponderous, compared with the size of the body; so that the muscles for its support, necessarily of great size, give great thickness to the neck, and by their origin from the prolonged dorsal vertebral processes form the peculiar projection called the *hump*. This hump is of an oblong form diminishing in height as it recedes, so as to give considerable obliquity to the line of the back.

C. A. Lesueur. del.

F. Kearny. Sc.

Bison.

The eye of the bison is small, black, and brilliant; the horns are black and very thick near the head, whence they curve upwards and outwards, rapidly tapering towards their points. The outline of the face is somewhat convexly curved, and the upper lip, on each side being papillous within, dilates and extends downwards, giving a very oblique appearance to the lateral gape of the mouth, in this particular resembling the ancient architectural basreliefs representing the heads of oxen.

The physiognomy of the bison is menacing and ferocious, and no one can see this formidable animal in his native wilds, for the first time, without feeling inclined to attend immediately to his personal safety. The summer coat of the bison differs from his winter dress, rather by difference of length than by other particulars. In summer, from the shoulders backwards, the hinder parts of the animal are all covered with a very short fine hair, that is as smooth and as soft to the touch as velvet. The tail is quite short and tufted at the end, and its utility as a fly-brush is necessarily very limited. The colour of the hair is uniformly dun, but the long hair on the anterior parts of the body is to a certain extent tinged with yellowish or rust colour. These animals, however, present so little variety in regard to colour, that the natives consider any remarkable difference from the common appearance as resulting from the immediate interference of the Great Spirit.

Some varieties of colour have been observed, although the instances are rare. A Missouri trader informed the members of Long's exploring party, that he had seen a greyish white bison, and a yearling calf, that was distinguished by several white spots on the side, a star or blaze in the forehead, and white fore feet. Mr. J. Doughty, an interpreter to the expedition, saw in an Indian hut a very well prepared bison head with a star on the front. This was highly prized by the proprietor, who called it his *great medicine*, for, said he "the herds come every season to the vicinity to seek their white faced companion."

In appearance the bison cow bears the same relation to the bull, that is borne by the domestic cow to her mate. Her size is much smaller, and she has much less hair on the fore part of her body. The horns of the cow are much less than those of the bull, nor are they so much concealed by the hair. The cow is by no means destitute of beard, but though she possesses this conspicuous appendage, it is quite short when compared with that of her companion.

From July to the latter part of December the bison cow continues fat. Their breeding season begins towards the latter part of July and continues until the beginning of September, and after this month the cows separate from the bulls in distinct herds and bring forth their calves in April. The calves rarely separate from the mother before they

are one year old, and cows are frequently seen accompanied by calves of three seasons.

The flesh of the bison is somewhat coarser in its fibre than that of the domestic ox, yet travellers are unanimous in considering it equally savoury as an article of food, we must, however, receive the opinions of travellers on this subject, with some allowance for their peculiar situations, being frequently at a distance from all other food and having their relish improved by the best of all possible recommendations in favour of the present viands—hunger. It is with reason, however, that the flesh is stated to be more agreeably sapid, as the grass upon which these animals feed is short, firm and nutritious, being very different from the luxuriant and less saline grass produced on a more fertile soil. The fat of the bison is said to be far sweeter and richer, and generally preferable to that of the common ox. The observations made in relation to the bison's flesh, when compared with the flesh of the domestic ox, may be extended to almost all wild meat, which has a peculiar flavour and raciness that renders it decidedly more agreeable than that of tame animals, although the texture of the flesh may be much coarser and the fibre by no means as delicate.

Of all the parts of the bison that are eaten, the hump is the most famed for its peculiar richness and delicacy; because when cooked it is said very much to resemble marrow. The Indian mode of cooking the hump is to cut it out from the vertebræ, after

which the spines of bone are taken out, the denuded portion is then covered with skin, which is finally sewed to the skin covering the hump. The hair is then singed and pulled off, and the whole mass is put in a hole dug in the earth for its reception, which has been previously heated by a strong fire in and over it the evening previous to the day on which it is to be eaten. It is then covered with cinders and earth about a foot deep, and a strong fire made over it. By the next day at noon it is fit for use. The tongues and marrow bones are also highly esteemed by the hunters. To preserve the flesh for future use the hunters and Indians cut it into thin slices and dry it in the open air, which is called *jerking;* this process is speedily finished, and a large stock of meat may thus be kept for a considerable length of time.

From the dried flesh of the bison the fur traders of the north west prepare a food which is very valuable on account of the time it may be preserved without spoiling, though it will not appear very alluring to those who reside where provisions are obtained without difficulty. The dried bison's flesh is placed on skins and pounded with stones until sufficiently pulverized. It is then separated as much as possible from impurities, and one third of its weight of the melted tallow of the animal is poured over it. This substance is called *pemmican,* and being packed firmly in bags of skin of a convenient size for transportation, may be kept for one year without

much difficulty, and with great care, perhaps two years.

During the months of August and September the flesh of the bison bull is poor and disagreeably flavoured; they are however much more easily killed, as they are not so vigilant as the cows, and sometimes allow the hunter to come up with them without much difficulty. Lewis & Clarke relate that once approaching a large herd, the bulls would scarcely move out of their way and as they came near, the animals would merely look at them for a moment, as at something new, and then quietly resume their grazing.

The general appearance of the bison is by no means attractive or prepossessing, his huge and shapeless form, being altogether devoid of grace and beauty. His gait is awkward and cumbrous, although his great strength enables him to run with very considerable speed over plains in summer, or in winter to plunge expeditiously through the snow.

The sense of smelling is remarkably acute in this animal, and it is remarked by hunters that the odour of the white man is far more terrifying to them than that of the Indian. From the neighbourhood of white settlements they speedily disappear: this, however, is very justly accounted for by Mr. Say, who attributes it to the impolitic and exterminating warfare, which the white man wages against all unsubdued animals within his reach.

As an exemplification of the peculiar strength of

their sense of smelling, we may here relate a circumstance mentioned by Mr. Say, in that valuable and highly interesting work, Long's Expedition to the Rocky Mountains, to which we are under continual obligations. These we are the more happy to acknowledge, because we are well acquainted with the solicitude of the gentlemen composing that expedition, to diffuse, as widely as possible, the knowledge of American Natural History.

The exploring party were riding through a dreary and uninteresting country, which at that time was enlivened by vast numbers of bisons, who were moving, in countless thousands, in every direction. As the wind was blowing fresh from the south, the scent of the party was wafted directly across the river Platte, and through a distance of eight or ten miles, every step of its progress was distinctly marked by the terror and consternation it produced among the bisons. The instant their atmosphere was infected by the tainted gale, they ran as violently as if closely pursued by mounted hunters, and instead of fleeing from the danger, they turned their heads towards the wind, eager to escape this terrifying odour. They dashed obliquely forward towards the party, and plunging into the river, swam, waded, and ran with headlong violence, in several instances breaking through the Expedition's line of march, which was immediately along the left branch of the Platte. One of the party, (Mr. Say himself,) perceiving from the direction taken by the bull who led the extended

column, that he would emerge from the low river bottom at a point where the precipitous bank was deeply worn by much travelling, urged his horse rapidly forward, that he might reach this station in order to gain a nearer view of these interesting animals. He had but just reached the spot when the formidable leader, bounding up the steep, gained the summit of the bank with his fore-feet, and in this position, suddenly halted from his full career, and fiercely glared at the horse which stood full in his path. The horse was panic-struck by this sudden apparition, trembled violently from fear, and would have wheeled and taken to flight, had not his rider exerted his utmost strength to restrain him; he recoiled, however, a few feet and sunk down upon his hams. The bison halted for a moment, but urged forward by the irresistible pressure of the moving column behind, he rushed onward by the half-sitting horse. The herd then came swiftly on, crowding up the narrow defile. The party had now reached the spot, and extended along a considerable distance; the bisons ran in a confused manner, in various directions, to gain the distant bluffs, and numbers were compelled to pass through the line of march. This scene, added to the plunging and roaring of those who were yet crossing the river, produced a grand effect, that was heightened by the fire opened on them by the hunters.

To the Indians and visiters of the western regions the bison is almost invaluable; we have mentioned

that they supply a large part of the food used by the natives, and covering to their tents and persons, while in many parts of the country there is no fuel to be obtained but the dried dung of this animal. The Indians always associate ideas of enjoyment with plenty of bison, and they frequently constitute the skull of one of them, their "Great Medicine." They have dances and ceremonies that are observed previous to the commencement of their hunting.

The herds of bison wander over the country in search of food, usually led by a bull most remarkable for strength and fierceness. While feeding, they are often scattered over a great extent of country, but when they move in mass they form a dense almost impenetrable column, which, once in motion, is scarcely to be impeded. Their line of march is seldom interrupted even by considerable rivers, across which they swim without fear or hesitation, nearly in the order that they traverse the plains. When flying before their pursuers, it would be in vain for the foremost to halt, or attempt to obstruct the progress of the main body, as the throng in the rear still rushing onward, the leaders must advance, although destruction awaits the movement. The Indians take advantage of this circumstance to destroy great quantities of this favourite game, and, certainly, no mode could be resorted to more effectually destructive, nor could a more terrible devastation be produced, than that of forcing a numerous

herd of these large animals, to leap together from the brink of a dreadful precipice, upon a rocky and broken surface, a hundred feet below.

When the Indians determine to destroy bison in this way, one of their swiftest footed and most active young men is selected, who is disguised in a bison skin, having the head, ears, and horns adjusted on his own head, so as to make the deception very complete, and thus accoutred, he stations himself between the bison herd and some of the precipices, that often extend for several miles along the rivers. The Indians surround the herd as nearly as possible, when, at a given signal, they show themselves and rush forward with loud yells. The animals being alarmed, and seeing no way open but in the direction of the disguised Indian, run towards him, and he, taking to flight, dashes on to the precipice, where he suddenly secures himself in some previously ascertained crevice. The foremost of the herd arrives at the brink—there is no possibility of retreat, no chance of escape; the foremost may for an instant shrink with terror, but the crowd behind, who are terrified by the approaching hunters, rush forward with increasing impetuosity, and the aggregated force hurls them successively into the gulf, where certain death awaits them.

It is extremely fortunate that this sanguinary and wasteful method of killing bisons is not very frequently resorted to by the savages, or we might expect these animals in a few years to become al-

most entirely extinct. The waste is not the only unpleasant circumstance consequent on it; the air for a long time after, is filled with the horrible stench arising from the putrefying carcases not consumed by the Indians after such an extensive and indiscriminate slaughter. For a very considerable time after such an event, the wolves and vultures feast sumptuously and fatten to tameness on the disgusting remains, becoming so gentle and fearless, as to allow themselves to be approached by the human species, and even to be knocked down with a stick, near places where such sacrifices of bison have been made. Lewis & Clarke bestowed the name of *Slaughter River* on one of the tributaries of the Mississippi, in consequence of the precipices along its sides, having been used by the Indians for this mode of killing the bison.

A better and more common way of killing bison is that of attacking them on horseback. The Indians, mounted and well armed with bows and arrows, encircle the herd and gradually drive them into a situation favourable to the employment of the horse. They then ride in and single out one, generally a female, and following her as closely as possible, wound her with arrows until the mortal blow is given, when they go in pursuit of others until their quivers are exhausted. Should a wounded bison attack the hunter, he escapes by the agility of his horse, which is usually well trained for the purpose. In some parts of the country, the hunter

is exposed to a considerable danger of falling, in consequence of the numerous holes made in the plains by the badger.

When the hunting is ended and a sufficiency of game killed, the squaws come up from the rear to skin and dress the meat, a business in which they have acquired a great degree of dexterity, as they can, with very inferior instruments, butcher a bison with far more celerity and precision than the white hunters.

If a bison is found dead, without an arrow in the body, or any particular mark attached, it becomes the property of the finder, so that a hunter may expend his arrows to no purpose when they fall off, after wounding or fairly perforating the animal. That the Indians do frequently send their arrows through the body of this animal is well attested by a great number of witnesses. In Long's expedition to the sources of St. Peters' river, it is related that Wahnita, a distinguished chief of the Sioux, has been seen to drive his arrow through the body of one bison, and sufficiently deep into the body of a second to inflict a deadly wound.

When the ice is breaking up on the rivers in the spring of the year, the dry grass of the surrounding plains is set on fire, and the bison are tempted to cross the river in search of the young grass that immediately succeeds the burning of the old. In the attempt to cross, the bison is often insulated on a large cake of ice that floats down the river. The

savages select the most favourable points for attack, and as the bison approaches, the Indians leap with wonderful agility over the frozen ice, to attack him, and as the animal is necessarily unsteady, and his footing very insecure on the ice, he soon receives his death wound and is drawn triumphantly to the shore.

The Cree Indians make a bison-pound, by fencing a circular space of about a hundred yards in diameter. The entrance is banked up with snow sufficiently high to prevent the animals from retreating after they have once entered. For about a mile on each side of the road leading to the pound, stakes are driven into the ground at nearly equal distances of about twenty yards, which are intended to look like men, and to deter the animals from endeavouring to break through the fence. Within fifty or sixty yards of the pound, branches of trees are placed between the stakes to screen the Indians who lie down behind them, to wait for the approach of the bison. The mounted hunters display the greatest dexterity in this sort of chase, as they are obliged to manœuvre around the herd in the plains so as to urge them into the road-way, which is about a quarter of a mile broad. When this is effected, the Indians raise loud shouts, and pressing closely on the animals, terrify them so much, that they rush heedlessly forwards towards the snare. When they have advanced as far as the men who are lying in ambush, they also show themselves in-

creasing the consternation of the bison by shouting violently and firing their guns. The affrighted animals have no alternative but to rush directly into the pound, where they are quickly despatched by guns or arrows. In the centre of one of these pounds, there was a tree on which the Indians had hung strips of bison flesh and pieces of cloth, as tributary or grateful offerings to the Great Master of life. They occasionally place a man in the tree to sing to the presiding spirit as the bisons advance. He is obliged to remain there until all the animals that have entered the pound are killed.*

The Ontawhaw Indians hunt the bison in the following manner. The hunters who are in advance of the main body on the march, employ telegraphic signals from an elevated position, to convey a knowledge of their discoveries to the people. If they see bisons, they throw up their robes in a peculiar manner as a signal for a halt. The hunters then return as speedily as possible to camp, and are received with some ceremony on their approach. The chiefs and magicians are seated in front of the people, puffing smoke from their pipes, and thanking the Master of life with such expressions as "thanks Master of life, thank you Master of life, here is smoke, I am poor, hungry, and want to eat." The hunters then draw near the chiefs and magicians, and in a low tone of voice inform them of

* See Franklin's Exp. p. 112.

their discovery; when questioned as to the number, they reply by holding up some small sticks in a horizontal direction, and compare one herd at a certain distance with this stick, and another with that, &c.

An old man or crier then harangues the people, informing them of the company, exhorting the women to keep a good heart, telling them that they have endured many hardships with fortitude, and that their present difficulties are ended, as on the morrow the men will go in pursuit of the bisons and bring them certainly a plenty of meat.

Four or five resolute warriors are appointed at the council of chiefs, held the evening previous, to preserve order among the hunters on the following day. It is their business with a whip or club, to punish those who misbehave, on the spot, or whose movements tend to frighten the game before all are ready, or previously to their arrival at the place whence they are to sally forth.

The next morning all the men, not superannuated, depart at an early hour, generally mounted and armed with bows and arrows. The superintendants or officers above mentioned accompany the swiftly moving cavalcade, on foot, armed with war clubs, the whole preceded by a footman bearing a pipe. When they come in sight of the herd the hunters talk kindly to their horses, using the endearing names of father, brother, uncle, &c., begging them not to fear the bisons, but to run well

and keep close, taking care at the same time not to be gored by them.

Having approached the herd as closely as they suppose the animal will permit without alarm, they halt, that the pipe bearer may perform the ceremony of smoking, which is thought necessary to success. The pipe is lighted, and he remains a short time with his head inclined, and the stem of the pipe extended towards the herd. He then puffs the smoke towards the bisons, the heavens, the earth, and the cardinal points successively. These latter are distinguished by the terms sun-rise, sun-set, cold country, and warm country.

This ceremony ended, the chief gives the order for starting. They immediately separate into two bands, which wheeling to the right and left, make a considerable circuit with a view to enclose the herd at a considerable interval between them. They then close upon the animals and every man endeavours to signalize himself by the number he can kill.

It is now that the Indian exhibits all his skill in horsemanship and archery, and when the horse is going at full speed, the arrow is sent with a deadly aim and great velocity into the body of the animal behind the shoulder, where, should it not bury itself to a sufficient depth, he rides up and withdraws it from the side of the wounded and furious animal. He judges by the direction and depth of the wound, whether it be mortal, and when the deadly blow is inflicted, he raises a triumphant shout to prevent

others from engaging in the pursuit, and dashes off to seek new objects for destruction, until his quiver is exhausted or the game has fled too far.

Although there is an appearance of much confusion in this engagement, and the same animal receives many arrows from different archers before he is mortally wounded or despatched, yet as every man knows his own arrows, and can estimate the consequences of the wounds he has inflicted, few quarrels ever occur as to the right of property in the animal. A fleet horse well trained, runs parallel with the bison at the proper distance, with the reins thrown on his neck, turns as he turns, and does not lessen his speed until the shoulder of the animal is presented, and the mortal wound has been given; then by inclining to one side the rider directs him towards another bison. Such horses are preserved exclusively for the chase and are very rarely subjected to the labour of carrying burdens.*

The effect of training, on the Indian horses, is well shown in a circumstance related by Lewis and Clarke. A serjeant had been sent forward with a number of horses, and while on his way, came up with a herd of bisons. As soon as the loose horses discovered the herd, they immediately set off in pursuit, and surrounded the bisons with almost as much skill as if they had been directed by riders. At length the serjeant was obliged to send two men

* Say, Long's Exp. to Rocky Mountains, v. 2.

forward to drive the bisons from the route before they were able to proceed.

The skins of the bison furnish the Indians and Whites with excellent robes, for bedding, clothing, and various purposes. These are most usually the skin of cows, as the hide of the bull is too thick and heavy to be prepared in the way practised by the squaws, which is both difficult and tedious. This consists in working the hide, moistened with the brains of the animal, between the hands, until it is made perfectly supple, or till the thick texture of the skin is reduced to a porous and cellular substance. These robes form an excellent protection from rain, when the woolly side is opposed to it, and against the cold when the woolly surface is worn next the skin. But when these robes are wet, or for a considerable time exposed to moisture, they are apt to spoil and become unpleasant, as the Indian mode of dressing has no other effect than to give a softness and a pliancy to the leather. On these robes the Indians frequently make drawings of their great battles and victories; a great variety of such painted robes are to be seen in the Philadelphia Museum. The hair of the bison has been used in the manufacture of a coarse cloth, but this fabric has never been extensively employed.

We have already adverted to the great numbers of these animals which live together. They have been seen in herds of three, four, and five thousand, blackening the plains as far as the eye could view.

Some travellers are of opinion that they have seen as many as eight or ten thousand in the same herd, but this is merely a conjecture. At night it is impossible for persons to sleep near them who are unaccustomed to their noise, which from the incessant lowing and roaring of the bulls, is said very much to resemble distant thunder. Although frequent battles take place between the bulls, as among domestic cattle, the habits of the bison are peaceful and inoffensive, seldom or never offering to attack man or other animals, unless outraged in the first instance. They sometimes, when wounded, turn on the aggressor, but it is only in the rutting season that any danger is to be apprehended from the ferocity and strength of the bison bull. At all other times, whether wounded or not, their efforts are exclusively directed towards effecting their escape from their pursuers, and at this time it does not appear that their rage is provoked particularly, by an attack on themselves, but their unusual intrepidity is indiscriminately directed against all suspicious objects.

We shall conclude this account of bison, by introducing the remarks of John E. Calhoun, Esq.,* relative to the extent of country over which this animal formerly roved and which it at present inhabits.

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* Long's Exp. to the source of the St. Peter's river, ii. p. 28.

The buffaloe was formerly found throughout the whole territory of the United States, with the exception of that part which lies east of Hudson's river and Lake Champlain, and of narrow strips of coast on the Atlantic and the Gulf of Mexico. These were swampy and had probably low thick woods. That it did not exist on the Atlantic coast is rendered probable, from the circumstance that all the early writers whom Mr. Calhoun has consulted on the subject, and they are numerous, do not mention them as existing then, but further back. Thomas Morton, one of the first settlers of New England, says, that the Indians "have also made description of great heards of well growne beasts, that live about the parts of this lake," Erocbise, now Lake Ontario, "such as the christian world, (untile this discovery,) hath not bin made acquainted with. These beasts are of the bignesse of a cowe, their flesh being very good foode, their hides good leather, their fleeces very useful, being a kind of wolle, as fine almost as the wolle of the beaver, and the salvages do make garments thereof;" he adds, "It is tenne yeares since first the relation of these things came to the eares of the English."*. We have introduced this quotation, partly with a view to show that the fineness of the buffalo wool, which has caused it within a few years, to become an object of

* New English Canaan, by Thomas Morton, Amsterdam, 1637, p. 98.

commerce, was known as far back as Morton's time; he compares it with that of the beaver and with some truth; we were shown lower down on Red river, hats that appeared to be of a very good quality; they had been made in London with the wool of the buffaloe. An acquaintance on the part of Europeans with the animal itself, can be referred to nearly a century before that: forin 1532, Guzman met with buffalo in the province of Cinaloa.* De Laet says, upon the authority of Gomara, when speaking of the buffalo in Quivira, that they are almost black, and seldom diversified with white spots.† In his history written subsequently to 1684, Hubbard does not enumerate this animal among those of New England. Purchas informs, us that in 1613 the adventurers discovered in Virginia, "a slow kinde of cattell as bigge as kine, which were good meate."‡ From Lawson, we find that great plenty of buffaloes, elks, &c., existed near Cape Fear river and its tributaries;§ and we know that some of those who first settled the Abbeville district in South Carolina, in 1756, found the buffaloe there. De Soto's party, who traversed East Florida, Georgia, Alabama, Mississippi, Arkansa Territory, and Louisiana, from 1539 to 1543, saw no buffaloe,

* De Laet, Americæ utriusque Descriptio, Lugd. Batav. anno 1633, lib. 6. cap. 6.

† Idem, lib. 6, cap. 17. ‡ Purchas ut supra, p. 759.

§ Lawson ut supra, p. 48, 115 &c.

they were told that the animal was north of them; however, they frequently met with buffalo hides, particularly when west of the Mississippi; and Du Pratz, who published in 1758, informs us that at that time the animal did not exist in lower Louisiana. We know however of one author, Bernard Romans, who wrote in 1774, and who speaks of the buffalo as a benefit of nature bestowed upon Florida. There can be no doubt that the animal approached the Gulf of Mexico, near the Bay of St. Bernard; for Alvar Nunez, about the year 1535, saw them not far from the coast; and Joater, one hundred and fifty years afterwards, saw them at the Bay of St. Bernard. It is probable that this Bay is the lowest point of latitude at which this animal has been found east of the Rocky Mountains. There can be no doubt of their existence west of those mountains, though Father Venegas does not include them among the animals of California, and although they were not seen west of the mountains by Lewis and Clarke, nor mentioned by Harmon and Mackenzie as existing in New Caledonia, a country of immense extent, which is included between the Pacific Ocean, the Rocky Mountains, the territory of the United States, and the Russian possessions, on the north-west coast of America. Yet their existence at present on the Columbia, appears to be well ascertained, and we are told that there is a tradition among the natives, that shortly before the visit of our enterprising explorers, destructive fires had raged over

the prairies and driven the buffalo east of the mountains. Mr. Dougherty, the very able and intelligent sub-agent, who accompanied the expedition to the Rocky Mountains, and who communicated so much valuable matter to Mr. Say, asserted that he had seen a few of them in the mountains, but not west of them. It is highly probable that the buffalo ranged on the western side of the Rocky Mountains, to as low a latitude as on the eastern side. De Laet says, on the authority of Henera, that they grazed as far south as the banks of the river Yaquimi.* In the same chapter this author states, that Martin Perez had, in 1591, estimated the province of Cinaloa, in which this river runs, to be three hundred leagues from the city of Mexico. This river is supposed to be the same, which, on Mr. Tanner's map of North America, (Philadelphia, 1822,) is named Hiaqui, and situated between the 27th and 28th degrees of north latitude. Perhaps, however, it may be the Rio Gila, which empties itself in latitude 32°. Although we may not be able to determine with precision, the southern limit of the roamings of the buffalo west of the mountains, the fact of their existence there in great abundance, is amply settled by the testimony of De Laet, on the authority of Gomara, l. 6, c. 17, and of Purchas, p. 778. Its limits to the north are

* "Juxta Vaquimi fluminis ripas tauri vaccæque et prægrandes cervi pascuntur," ut supra lib. 6 cap. 6.

not easier to determine. In Hakluyts' collection we have an extract of a letter from Mr. Anthonie Parkhurst, in 1578, in which he uses these words; in the Island of Newfoundland there "are mightie beastes, like to camels in greatnesse, and their feete cloven. I did see them farre off, not able to discerne them perfectly, but their steps shewed that their feete were cloven and bigger than the feete of camels. I suppose them to be a kind of buffes, which I read to bee in the countrys adjacent and very many in the firme land."* In the same collection, p. 689, we find, in the account of Sir Humphrey Gilbert's voyages, which commenced in 1583, that there are said to be in Newfoundland, "buttolfles, or a beast, it seemeth by the tract and foote, very large in the manner of an oxe." It may, however, be questioned whether these were not musk oxen, instead of the common buffalo or bison of our prairies. We have no authority of any weight, which warrants us in admitting that the buffalo existed north of Lakes Ontario, Erie, &c. and east of Lake Superior. From what we know of the country between Nelson's River, Hudson's Bay, and the lower Lakes, including New South Wales and Upper Canada, we are inclined to believe that the buffalo never abounded there, if indeed any were

* The principal navigations, voyages, and discoveries of the English nation, &c. by Richard Hakluyt, London, 1589, p. 676.

ever found north of the lakes. But west of Lake Winnepeck, we know that they are found as far north as the 62nd degree of north latitude. Capt. Franklin's party killed one on Salt river, about the 60th degree. Probably they are found all over the prairies which are bounded on the north by a line commencing at the point at which the 62nd degree meets the base of the Rocky Mountains, and running in a south easterly direction, to the southern extremity of Lake Winnepeck, which is but very little north of the 50th degree; on the Sardatchawan, buffalo are very abundant. It may be proper to mention here, that the small white buffalo, of which Mackenzie makes frequent mention, on the authority of the Indians, who told him that they lived in the mountains, is probably not the bison; for Lewis and Clarke inform us, that the Indians designated by that name the mountain sheep.* It is probable that west of the Rocky Mountains the buffalo does not extend far north of the Columbia. At present it is scarcely seen east of the Mississippi, and south of the St. Lawrence. Governor Cass's party found in 1819, buffalo on the east side of the Mississippi, above the falls of St. Anthony: every year this animal's rovings are restricted. In 1822, the limit of its wanderings down the St. Peter, was Great Swan Lake (near Camp Crescent.)

* Vol. ii. p. 325.

Drawn by C.A.Lesueur.

Engd. by G.B.Ellis

Species II.—*The Musk Ox.*

Bos Moschatus Gmel.

Musk Ox: Penn. Quad. i. 31. Ibid, Arct. Zool. 3 vol. i. 8.
Musk Ox: Hearne, Journey &c. 8vo. 135.
Bœuf Musqué: Buff. Hist. Naturelle Suppl. vi.
Ovibos Musqué:* Blainv. Nouv. Bullet. de la Soc. Philom.
Musk Ox: Parry's Voyage. i. 202.

[*Called Mathek-Mongsoo, or Ugly Moose, by the Crees, Uming Mak, by the Esquimaux.*]

To civilized man, the extreme northern regions may appear cheerless and uninviting, because they are subjected to the almost unrelenting influ-

* Mr. De Blainville proposed to establish a new genus, to be called *Ovibos* or Sheep-ox, of which the Musk-ox is the first species. His *generic* distinctions are drawn from the resemblance between the outline of the front of the musk-ox and that of the sheep, and from the absence of the muzzle or smooth naked surface, between the nostrils, and upon the upper lip. This division, though as well founded as that which separates *Capra* from *Ovis*, we conceive to be altogether unnecessary, as the characters are not more than sufficient to establish a *specific* difference. In regard to the muzzle, nothing is said in the text of Parry's work, though it is very distinctly represented in the plate, which is said to be very accurate, and which we have copied; as the common descriptions of the musk-ox, have mostly been taken from dried skins, it is possible, that the absence of the muzzle has been stated too hastily.

ence of wintry skies. Yet we have already seen that they are the favourite resorts of multitudes of animals, varying in size, characters and habits, from the Lemming to the Moose. A species remains to be described, which, of these forbidding regions prefers the most barren and desolate parts, and is found in the greatest abundance in the rugged and scarcely accessible districts lying nearest the North Pole. This species, so far from being condemned to a life of extreme privation and suffering, appears to derive as much enjoyment from existence, as those which feed in more luxuriant pastures, or bask in the genial rays of a summer sun.

In destining the musk ox to inhabit the domains of frost and storm, nature has paid especial attention to its security against the effects of both; first, by covering its body with a coat of long, dense hair, and then, by the shortness of its limbs, avoiding the exposure that would result from a greater elevation of the trunk. The projection of the orbits of the eyes, which is very remarkable in this species, is thought by PARRY to be intended to carry the eye clear of the large quantity of hair required to preserve the warmth of the head.

Although some few items relative to this animal are to be gathered from the works of the recent explorers of the Northern Regions, it is to HEARNE, that we are almost exclusively indebted for the Natural History of the musk ox, as we have already been for that of most of the animals inhabiting the

same parts of this continent. This excellent and accurate observer travelled, in the years '69, '70, 71, and '72, and it is only to be regretted that he did did not write down all he knew in relation to the northern animals. He appears to have frequently thought that what was so familiarly known to him, would not be of much interest to others, and has thus withheld knowledge that few individuals can have a similar opportunity of gaining. Notwithstanding this, he has anticipated all the recent explorers in every essential observation.

HEARNE states that he has seen many herds of musk oxen in the high northern latitudes, during a single day's journey, and some of these herds contained from eighty to a hundred individuals, of which number a very small proportion were bulls, and it was quite uncommon to see more than two or three full grown males, even with the largest herds. The Indians had a notion that the males destroyed each other in combating for the females, and this idea is somewhat supported by the warlike disposition manifested by these animals during their sexual season. The bulls are then so jealous of every thing that approaches their favourites, that they will not only attack men or quadrupeds, but will run bellowing after ravens or other large birds that venture too near the cows.

Musk oxen are found in the greatest numbers within the arctic circle; considerable herds are occasionally seen near the coast of Hudson's bay,

throughout the distance from Knapp's Bay to Wager Water. They have in a few instances been seen as low down as lat. 60° N. Capt. Parry's people killed some individuals on Melville Island, which were remarkably well fed and fat. They are not commonly found at a great distance from the woods, and when they feed on open grounds they prefer the most rocky and precipitous situations. Yet, notwithstanding their bulk and apparent unwieldiness, they climb among the rocks with all the ease and agility of the goat, to which they are quite equal in sureness of foot. Their favourite food is grass, but when this is not to be had, they readily feed upon moss, the twigs of willow, or tender shoots of pine.*

The appearance of the musk ox is singular and imposing, owing to the shortness of the limbs, its broad flattened crooked horns, and the long dense hair which envelopes the whole of its trunk, and hangs down nearly to the ground. When full

* It is singular and well worthy of observation, that the dung of the musk ox, though so large an animal, is not larger than, and, at the same time, is so nearly of the shape and colour of that of the Alpine Hare, that the difference is not easily distinguished except by the Indians, though the quantity generally indicates the animal to which it belonged. In the country adjacent to the Coppermine river, long ridges of this dung, together with that of deer and other animals were seen by Hearne. Similar appearances were observed by Parry on several of the North Georgian Islands.

grown, the musk ox is ten hands and a half high, according to Parry, and as large as the generality, or at least the middling size of English black cattle; but their legs, though large, are not so long; nor is their tail longer than that of a bear, and like the tail of that animal it always bends downwards and inwards, so that it is entirely hid by the long hair of the rump and hind quarters. The hunch on their shoulders is not large, being little more in proportion than that of a deer. Their hair is in some parts very long, particularly on the belly, sides and hind quarters; but the longest hair about them, particularly the bulls, is under the throat, extending from the chin to the lower part of the chest, between the forelegs; it there hangs down like a horse's mane inverted, and is full as long.*

* "Mr. Dragge says in his voyage, vol. 2, p. 260, that the musk ox is lower than a deer, but larger as to belly and quarters; which is very far from the truth. 'They are of the size I have here described them, and the Indians always estimate the flesh of a full grown cow to be equal to three deer. I am sorry also to be obliged to contradict my friend Mr. Graham, who says that the flesh of this animal is carried on sledges to Prince of Wales' Fort, to the amount of three or four thousand pounds annually. To the amount of near one thousand pounds may have been purchased from the natives in some particular years, but it more frequently happens that not an ounce is brought one year out of five, and in fact, all that has ever been carried to Prince of Wales' Fort, has most assuredly been killed out of a herd

The winter coat of the musk ox is formed of two sorts of hair, which is generally of a brownish red, and in some places of a blackish brown colour; the external being long, coarse, and straight, and the internal, fine, soft and woolly. The outer hair is so long that it hides the greater part of the limbs, causing them to look disproportionately short. As the summer comes on, the short woolly hair is gradually shed, but the summers are so short in these high latitudes, that the woolly coat commences growing almost immediately after the old coat is shed, so that the entire winter coat is completed by the return of the cold weather.

From the shortness of the limbs and the weight of the body, it might be inferred that the musk ox could not run with any speed; but it is stated by Parry, that although they run in a hobbling sort of canter that makes them appear as if every now and then about to fall, yet the slowest of these musk oxen can far outstrip a man. When disturbed and hunted, they frequently tore up the ground with their horns, and turned round to look at their pursuers, but never attempted to make an attack.

The month of August is the season in which the musk bulls are the most disposed to combat, as they

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that has been accidentally found within a moderate distance of the settlement, perhaps within a hundred miles; which is only thought a step by an Indian." Hearne, 136. (The fort he mentions, was destroyed by the French in 1782.)

then fight furiously with each other for the females, and are jealous of the approach of every thing, as already stated. The cows calve about the end of May or the beginning of June; the calves are frequently whitish, but more commonly marked by a white patch or saddle upon the back.

The musk oxen killed on Melville island during PARRY'S visit, were very fat, and their flesh, especially the heart, although highly scented with musk, was considered very good food. When cut up it had all the appearance of beef for the market. HEARNE says that the flesh of the musk ox does not at all resemble that of the bison, *(Bos Americanus)* but is more like that of the moose; and the fat is of a clear white tinged with light azure. The young cows and calves furnish a very palatable beef, but that of the old bulls is so intolerably musky, as to be excessively disagreeable. A knife used in cutting up such meat, becomes so strongly scented with this substance, as to require much washing and scouring before it is removed.* Musk ox flesh when dried, is considered by hunters and Indians to be very good. "In most parts of Hudson's Bay it is known by the name of Kew-hagon, but amongst the Northern Indians it is called Achees." The weight of

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* Moschus iste glandulis juxta præputium positis efformari videtur; ibi materia fusca, concreta, fortissime moschi odorans inventa est.

the musk ox, according to Parry, is about 700 lbs. that of the head and hide is 130lbs.

The horns of the musk ox are employed for various purposes by the Indians and Esquimaux, especially for making cups and spoons. From the long hair growing on the neck and chest, the Esquimaux make their musquitoe wigs, to defend their faces from those troublesome insects. The hide of the musk ox makes good soles for shoes, and is much used by the natives for this purpose.

During the months of August and September the musk oxen extend their migrations to the North Georgian and other islands bordering the northern shores of the continent. By the first of October they have all left the islands and moved towards the south. By Franklin's Expedition, they were not seen lower than 66° N. though, as we have before stated from Hearne, they are occasionally seen as low as 60°.

CHAPTER II.

Order VIII. Cete; *Cetaceous Animals.*

Cetaceous animals in general appearance and in mode of living, bear a considerable resemblance to fish, with which they are popularly confounded; but by all the details of their conformation, their manner of respiration and the nourishment of their offspring, they are entitled to rank in the first class of animals, although at the inferior extremity of the scale.

In these creatures the head is joined to the trunk by so short and thick a neck, as to appear continuous with the body, and this large neck is in the greater number capable of very little, if any motion, owing to the consolidation of several of the slender cervical vertebræ. The trunk of the body gradually decreases until it terminates in a thick tail, which ends in a horizontal cartilaginous fin, and when used by the animal in effecting its forward motion, is moved up and down, never laterally.

The anterior extremities or arms, although in all respects analogous to those of the higher orders of animals, have the bones shortened, flattened and en-

veloped in a tendinous membrane, so as to be effectually converted into fins. The posterior extremities or limbs are entirely wanting.

The brain is large and well developed. The bone containing the organ of hearing, or internal ear, is separated from the rest of the head, being attached thereto by ligament alone. The orifice of the external ear is very small and destitute of external appendage. The teats, two in number, are either pectoral or abdominal.

CHAPTER III.

Family I. Sirénia; *Herbivorous Cetacea.*

This family is distinguished especially by the vegetable diet of the animals belonging to it, which is indicated by their flat grinding teeth. The head is not very large, and has always a short and obtuse snout, at the extremity of which the external openings of the nostrils are situated, notwithstanding they pass through the bones of the head from the superior part. The mouth is garnished with long bristles or whiskers, and the teats are situated upon the chest.

The anterior extremities, though compressed, are still sufficiently free to allow them to be used for the purpose of carrying any thing by holding it against the body, the young, for instance, being thus held by the mother. The tail is not very large, but is powerful. These animals swim with great facility, and as they are able to raise the anterior parts from the water, so as to form a considerable angle with the trunk, it is considered as highly probable that the various fables of sirens, tritons and mermaids may

have originated from an imperfect observation of their actions.

It must be admitted that the members of this family, present little in their general appearance to excite attention, unless it be their huge and almost shapeless bodies; but their internal structure, actions and habitudes, afford very ample scope for interesting observations, and philosophical inquiry; as it would not be easy, from any previous knowledge, to believe that merely herbivorous animals would be found inhabiting the ocean, conformed in all respects, so as closely to approach in external appearance to fish, and yet in all the characters of teeth, mode of feeding and digestive organs, to bear a very marked resemblance to herbivorous land quadrupeds.

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Fig. 1.

Male Narwal, or Unicorn

15 Ft. in length.

Fig. 2.

Under side view of the same Narwal.

Fig. 3.

W.H. Fisher Sc.

Lamantin.

CHAPTER IV.

Genus I.—Lamantin; *Manatus*, C.

Generic Characters.

The head is small and conical with a broad snout, and rather small mouth; the eyes are placed high up between the extremity of the snout and the openings leading to the ears, which are very small and hardly visible. The spine is composed of seven very short cervical, seventeen dorsal, two lumbar, and twenty-two caudal vertebræ. The ribs are seventeen in number. In addition to the shoulder blade, arm and forearm, the lamantins have all the wrist or carpal bones, with the single exception of the pisiform, the phalanges of the thumb are wanting, and the corresponding metacarpal bone terminates in a point. All the other digits have three phalanges. The stomach has several cavities, the cœcum two branches, and the colon is very large; in all which circumstances they strongly resemble the pachydermatous land animals, along with which

they have been considered by some naturalists.* The surface of the body is entirely destitute of hair.

Dental System.

34 Teeth: { 18 Upper { 2 Incisive. 16 Molar. } 16 Lower { 16 Molar. }

In the upper jaw; in young individuals two small pointed incisive teeth are found, somewhat similar to those of the morse. There are no canines. The eight molars resemble each other; they have a general square form, and all present two transverse eminences, formed of three tubercles, separated from each other by a deep groove: they all have three divergent roots, one internal, the other two external. They increase gradually, but almost imperceptibly, in size from the first to the last.

In the lower jaw, neither incisive nor canine teeth are ever found, and the molars resemble those of the upper jaw, except in having a spur posteriorly, or a third eminence much smaller than the others. These teeth have two roots, one in front,

* Blainville at first arranged them with the unguligrada, and subsequently with the gravigrada, as the Elephants, &c. See Ranzani, Elem. di Zoologia, ii. parte iii. p. 670.

the other behind, at first simple, but enlarged, and are bifurcated at their extremity.

In their reciprocal position, the eminences on one side, correspond to the grooves and intervals of the teeth on the opposite side, and to judge by the preservation of the crests of the eminences, it appears that these teeth are used more for triturating, than for crushing or bruising the food.

Species I.—*American Lamantin.*

Manatus Americanus.

Trichecus Manatus, L. Systema Naturæ.
Manate ou Vache Marine: Dampier, voyage i. 46. Sloane, Jamaica, ii. 329, La Condamine, voyage, 154.
Manati Phocæ genus, Clus. exot. 132.
Lamantin ou Manaty: Du Tertre, Hist. gen. des. Antilles.
Grand Lamantin des Antilles, Buff. Hist. Naturelle xiii. 377, C. Ann. du Museum xviii. 282. pl. 19. Iain. Ossem. Foss iv. Desm. Nouv. Dict. d'Hist. Nat. xviii. 213 pl. G. 9.
Manatee, or Sea Cow: Bartram, Travels in Florida, 231.

If the reader infer from the number of authorities prefixed to this article, that the history of the species is amply or satisfactorily known, he will fall into an error, which a very little experience in books of travels, or systematic works of natural history would serve to correct. Indeed, as a general rule, the number of references affixed, is in an inverse proportion to the amount of knowledge con-

cerning the animal treated of, and it not unfrequently happens that the mere mention of the name of a species, is all that occurs in a book quoted with all the formality of title and page. Bartram, for instance, who travelled in the country where the lamantin is most commonly found, gives the whole amount of his observation in nine unsatisfying lines. Other observers, who have enjoyed equally good opportunities, have contented themselves with a mention of the animal, taking it for granted that no other information was desirable.

Of this species we know little or nothing, but what is given by Cuvier in the scientific works above quoted, and from the observations made by Du Tertre in his history of the Antilles.

The general figure of the lamantin is rather elliptical and elongated. Its head is shaped like a simple truncated cone, and terminates in a thick and fleshy snout, semi-circular at its extremity, and pierced at its upper part, by two small semilunar nostrils, directed forwards. The edge of the upper lip is tumid, furrowed in the middle, and provided with thick and stiff whiskers. The lower lip is narrower and shorter than the upper, and the opening of the mouth is small. The eyes are situated towards the upper part of the head, at the same distance from the snout, as the angle of the lips. The ears are very small, scarcely perceptible, and placed at the same distance from the eyes, that the latter are from the snout.

The neck is not distinguishable by any diminution or difference in size from the head and trunk, and the latter does not diminish except from the umbilicus, whence it rapidly decreases, until it spreads out and becomes flattened, forming an oblong tail with a broad, thin, and seemingly truncated extremity. The tail forms about a fourth of the length of the animal.

The arm bones which sustain the fins are more separated from the body, than those of the Delphinus, and have digits more distinguishable through the integuments. The edges of this fin have four flat and rounded nails, which do not extend beyond the membrane, the nail of the thumb being deficient. The skin is of a gray colour, is slightly shagreened, and has upon it a few scattered hairs, which are more numerous than elsewhere about the angles of the lips, and the palmar surface of the fins.

The full grown lamantin is from fifteen to twenty feet in length, by eight in circumference, and weighs several thousand pounds.

Du Tertre states that the sight of the lamantin is very feeble, but this defect is compensated by the extreme acuteness of its hearing. In these respects it closely resembles the seal. After having satisfied its hunger by feeding on the sea grass or fucus, which constitute its principal nourishment, it delights to sleep upon the marshy grounds in

shallow water, where it lies with the snout elevated above the water.

When the lamantin is discovered in this situation, the following mode of securing it, is resorted to; three, or at most, four persons get into a canoe, which is managed by the man in the bow, who moves his paddle from right to left, without lifting it from the water, so as to impel the canoe swiftly and without noise. The harpooner sits on a board placed across the canoe in the forward part, and the third person is placed in the middle of the boat to manage the line attached to the end of the harpoon.

The canoe is then swiftly paddled towards the sleeping animal, the men observing the most profound silence. When within three or four paces of the lamantin, the harpoon is suddenly struck into its body. The most violent efforts are then made by the wounded animal, which leaps up and springs forward with great force, making the sea foam, by the celerity of its movements. Tired, at length, with fruitless efforts to escape, and weakened by loss of blood, the lamantin stops short, is again wounded by other harpoons, and after a few more unavailing struggles, yields its liberty and life together.

The female lamantin brings forth her two young, which follow her closely, and are very certainly captured, if the mother be killed. The flesh of the lamantin is considered an excellent article of diet, and has, at former periods, furnished a large part of

the subsistence of the inhabitants of St. Christophers, Guadaloupe, and Martinique. This flesh has the taste of veal, but is more solid, and covered in various parts with two or three inches of fat, which is used for the same purposes that lard is commonly employed for. It is so good that many persons melt the fat, and eat the oil upon bread instead of butter. When salted, the flesh of the lamantin loses its flavour and becomes very dry and hard.

The name of manati, (subsequently changed to lamantin,) is said to have been originally given to this animal by the Spaniards, in consequence of its short anterior extremities, which were regarded as hands.

CHAPTER V.

Genus II.—Steller; *Stellerus*, C.

Rytina, Ill. *Trichecus*, Gmel. *Manatus*, Stell.

GENERIC CHARACTERS.

The head is blunt, joined to the body by a short indistinct neck, and has no external ears; the eyes are defended by a sort of cartilaginous membrane instead of lids; the nostrils are situated at the extremity of the snout; both upper and lower lips are vertically divided. The anterior extremities end in flippers similar to those of the sea-turtle. The caudal fin is very broad, crescent shaped, and terminates on each side by a large point. The skin is hairless, but is defended by an uncommonly thick epidermis, composed of fibres perpendicular to the true skin. The stomach is simple; the intestines upwards of 400 feet in length; the cœcum of vast size, and divided into huge pouches.

Dental System.

4 Teeth { 2 Upper { 2 Molar. / 2 Lower { 2 Molar.

These teeth are not set in the jaw by roots, but are affixed by nervous and vascular connexions.* The grinding surface is very rough, being hollowed so as form many tortuous canals.

Species I.—*Boreal Steller.*†

Stellerus Borealis; Desm.

Manatus: Stell. Act. Petrop. Com. Nov. ii. 294.
Trichecus Manatus: V. Borealis, Gmel.
Whale-tailed Manati: Penn. Arct. Zool.
Whale-tailed Trichecus: Shaw, Gen. Zool.
Rytina Stelleri: Desm. N. Dict. d'Hist. Nat. xxix. 373.
Stellerus Borealis: Desm. Mammalogie sp. 739, p. 510.

The only detailed account of the manners and habits of this singular animal, is that originally given by *Steller* in the transactions of the Imperial Academy of Sciences of St. Petersburg, in 1749. From his valuable paper, which contains numerous highly interesting observations on other animals, we have translated the following faithfully observed facts.‡

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* Resembling in this respect the duckbill animal of New Zealand &c.

† Cuvier named the genus formed for this species, in honour of Steller; we use his name for the common appellation, because we wish to avoid confounding this animal with the *Manati* by using Pennant's term.

‡ This paper is entitled "De Bestiis marinis auctore

An unfortunate accident gave me an opportunity of observing the manners and habits of these animals, daily, before the door of our hut. They delight in the shallow sandy places, near the shores of the sea, and are very fond of frequenting the mouths of brooks and little rivers, being allured by the sweetness of the running water; they always go in troops, the half grown and young occupy the front in feeding, but are solicitously enclosed on the flanks and rear, so as to be always kept in the midst of the troop. When the tide is high, they come so close to the shore, that I have not only frequently touched them with a staff or lance, but have placed my hand upon their backs. If struck with some force, they did nothing more than move a little farther off, and in a short time forgetting the injury, they would return. Entire families commonly live together, a male with a single female, and a small quite young cub. They appeared to me to be monogamous, bringing forth at any time of the year, but most generally in the autumn, as I should judge from the young about that time; hence as I have observed them, most especially to couple in the spring. I have concluded, that they bear their young for more than a year, and do not bring forth but one cub at a birth. I never observed more than one cub in company with the mother.

Georgio Wilhelmo Stellero." Vide. Nov. Comm. Acad. Scien. Imper. Petropolitanæ, tom. 2, p. 289, 294, et seq.

These most voracious animals are almost incessantly feeding, and on account of this greediness, have their heads nearly always under water, being very little solicitous concerning life and safety. A boat or a man may go into the midst of a troop, and one may be selected and secured by a hook without difficulty. All this must be done while they are feeding, as at the end of every four or five minutes, they raise their nostrils above water, and blow out the air with a small quantity of water, making a noise like the snorting of a horse. While grazing, they move slowly forwards, one foot after the other, and thus in part placidly swim, and partly walk, like oxen or sheep browsing. The half of the body, that is, the back and sides, always project above the water while they are feeding, and the gulls alight thereon for the purpose of picking up the parasite animals with which their hides are much infested, just as the ravens alight on the backs of hogs to catch their lice.

They do not devour all the sea-weeds indifferently, but chiefly two or three species of Fucus or Kelp, of which, when these animals have remained a day or so in one vicinity, large heaps of the roots and stalks are thrown ashore by the waves. Having gorged themselves fully, some of them sleep upon their backs, at some distance from the shore, lest they be left aground by the tide. They are frequently killed by the floating ice in winter, which especially occurs if the waves are blown

forcibly upon the rocks, among which these beasts are entangled and killed. In the winter they become so thin, that in addition to the back bones, all the ribs may be counted through the skin.*

They are caught with a large iron hook, whose extremity resembles the fluke of an anchor; the other end has a ring to which a strong rope is secured. A strong man takes this hook, and in company with four or five others goes into a boat, which is slowly rowed towards the herd. The bearer of the hook stands in the prow of the boat, and as soon as he comes near enough, strikes it into one of the animals. Thirty or more persons on shore then get hold of the rope and drag the struggling victim towards the land. Those in the boat make themselves fast to the beast with another rope; and so fatigue it by repeated blows, until it becomes quiet, and then is despatched by spears, knives, and other weapons, and drawn on shore. Some cut huge pieces out of the living animal, which only provoked it to vibrate its tail, and struggle with its fore limbs so violent-

* "Vernali tempore more humano coeunt, ac præcipue circa vesperam tranquillo mari; antequam vero congrediuntur præludia multa veneræ præmittunt; fœmella placide natat hinc et inde in mari, mas vero semper sequitur; hunc fœmella tam diu multis gyrps et meandris eludit, donec moræ ulterioris ipsa impatiens, velut delassata ac coacta, se in dorsum resupinet, quo facto mas furiose superveniens libidinis tributum solvit, ac ambo in mutuos amplexus ruunt." *Steller* ut supra.

ly, as to cause large pieces of the cuticle to fly off; it breathed strongly, and as if sighing. When wounded in the back, the blood spirts as high as if from a fountain; but this did not occur as long as the head was retained under water, but as soon as it was raised for the purpose of breathing, the blood gushed forth, because the lungs, lying next the back, being wounded, whenever the air was inhaled, it forced out the blood more freely.

When one of these animals is hooked, he begins to move more impetuously, whereupon the herd and those which are near are set in motion, and endeavour to assist the captive. Some of them strive to upset the boat, others endeavour to break the rope, or by blows with their tails, try to disengage the hook, which they sometimes successfully accomplish. It is a very curious trait in their character, that their conjugal love is exceedingly great: when the male is hooked, the female, after having in vain struggled to set him free, and been herself struck frequently, would nevertheless follow her companion to the shore, and would sometimes unexpectedly approach the dead body, by darting forwards like an arrow. One morning, when we came down very early to cut up the flesh and carry it home, we found the male near the body of his mate, and he remained near, even until the third day afterwards, when I went down to the shore alone, for the purpose of cleaning some of the intestines.

This animal has no voice, nor utters any sound, merely breathing forcibly, and when wounded, as if by sighs. Its organs of sight and hearing are of slight power, as they are almost always submerged and appear to be little employed.

We have stated in the specific description, as well as the generic characters, the peculiar structure of the skin of the steller. It will perhaps be still more satisfactory to the reader to have the more detailed description of it from the original observer, whose statement we subjoin.

The hide of this animal is black, rough, wrinkled, knotty, hard, tough, and destitute of hair, the epidermis being an inch thick, and scarcely to be penetrated by an axe or an iron hoole. When cut transversely, this cuticle resembles ebony, both in polish and colour. The skin is smooth on the back; from the neck, to the tail fin, it has nothing but superficial circular wrinkles: the sides, however, are exceedingly knotty, having many prominent acetabula, especially about the head, bearing an unpleasant resemblance to mushrooms.

The cuticle above described, is like a crust surrounding the body, and appears to be composed of meré tubes. These tubes are placed perpendicularly to the true skin, and may be separated from each other in their length. The inferior part of each tube which is implanted in the skin, is rounded, convex and bulbous; hence, a portion of cuticle torn off, appears tuberculous like Spanish hide, while the subjacent skin presents the appearance of

numerous little pits, which the cuticular bulbs had occupied. As these tubuli lie very closely together, are tough, moist and tumid, when the skin is cut horizontally they do not appear, but present a smooth surface like the pared hoof of an animal; if pieces be dried in the sun, they crack perpendicularly and may be broken like bark, at which time, this tubular structure, is perfectly obvious. Through these tubes a mucous matter flows, especially upon the sides, and about the head, and in smaller quantities upon the back. When this beast lies upon the shore for some hours, the back becomes dry, but the head and sides remain moist. The use of this singular cuticle appears to be, 1st. to preserve them from being destroyed by being thrown against the ice in winter, or the rocks at all times, and 2dly, that the vital heat may not be too much dissipated in summer, by excessive transpiration, or altogether extinguished by the cold of winter. They do not, like other animals and fish, retreat to the depths of the sea, but always expose half of their bodies to the air, while feeding.

The cuticle about the head, eyes, ears, and mammæ, and under the arms, wherever it is knotty, is attacked and infested by insects. It often happens that they perforate the cuticle and wound the true skin, in which case, large and thick warts are formed.

The true skin is about the sixth of an inch thick, is soft, white, very strong, and similar to the skin of the whale.

CHAPTER VI.

Family II.—Cetæ; *Piscivorous Cetaceous Animals.*

This family is distinguished from the preceding, by the construction which has procured for all its members the name of *blowers*, in reference to the manner in which they expel the water taken in along with their food from the nasal openings. The membrane lining the nostrils being thus continually exposed to torrents of salt water, has very little, if any sensibility as an organ of smelling.

They have a pyramidal larynx, or windpipe, which is extended to the posterior opening of the nostrils, through which the air is admitted to the lungs without requiring the head and mouth to be raised above the water. Their glottis is altogether plain, and their voice is reduced to a simple bellowing. The body is destitute of hair, but is covered by a thick, smooth skin, beneath which is a great thickness of strong cellular substance containing a large quantity of oil.

The teats are situated near the anus; the fins are of no use except in swimming. Two small bones

situated in the flesh near the extremity of the digestive canal, are the only vestiges of inferior extremities. Some have a dorsal fin, which is tendinous and not connected with the skeleton.

Some of these animals have conical teeth, all of the same sort, arranged along the edges of the jaws; others have only horny layers, projecting from the roof of the mouth, well known by the name of *baleen*, though generally and inaccurately called *whalebone*.

The eyes, which are flat anteriorly, have a very thick and solid sclerotica or external coat. The tongue is covered by soft and thick integument. The stomach has from five to seven distinct pouches, and instead of one spleen, there are several, which are small and lobular.

TRIBE I.—DELPHINUS; L. *Dolphin Proper;* C.

Having teeth in both jaws, always simple and almost always conical. They have the mouth formed in advance of the head, by a sort of beak, smaller than the rest of the head. They are destitute of cœcum.

CHAPTER VII.

SECTION I.—*Size of the head bearing the ordinary proportion to that of the body.*

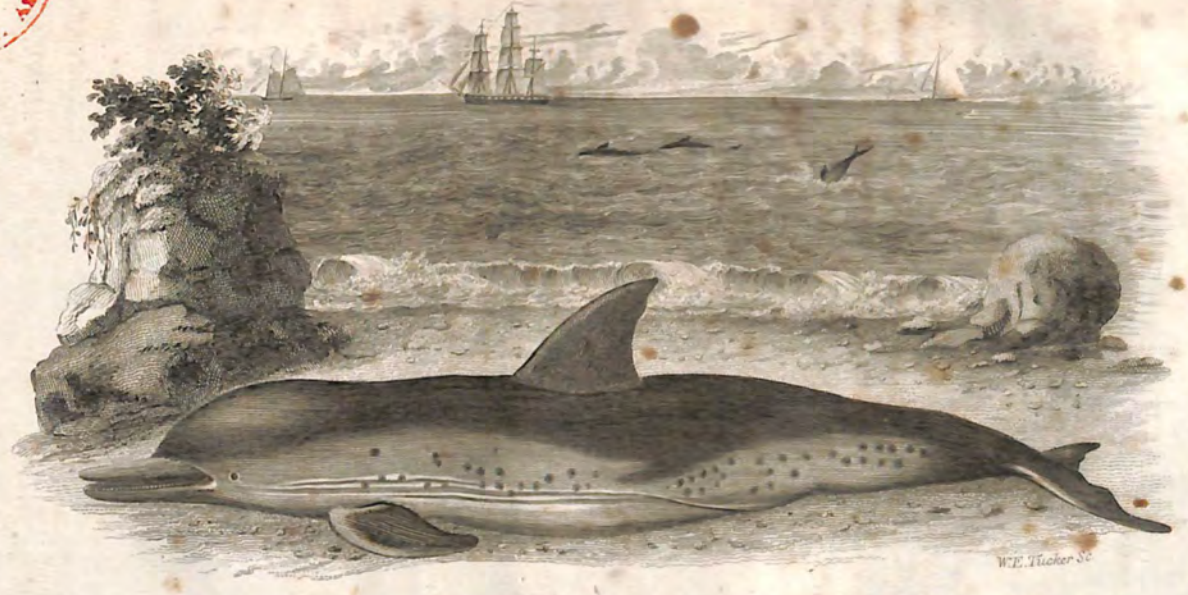
GENUS?—DOLPHIN; *Delphinus;* L.

GENERIC CHARACTERS.

THE form of the head is very various; there is but one, semilunar, external orifice to the nostrils, which is situated upon the crown of the head; the trunk of the body is elongated; the tail fin is large, bifurcated and horizontal.

Dental System.

The teeth of the pisciverous cetæ scarcely differ from each other, except in number, all appearing to have the same form. They are conical and slightly hooked; only the larger species have larger teeth than the smaller, and when their series are numerous, the anterior and posterior are smaller than those in the middle. None of them have the alveolar processes divided, nor multiplex roots; the dental capsule remains for a long time free at the base; but these teeth are not always growing, as the



Dolphin.

capsule is eventually obliterated. Then another event occurs; ossification of the jaws takes place within the alveoles, and as the teeth are not opposed to each other, and no force retains them in their places, they are soon thrust out and disappear. This explains the very variable number of teeth we find in dolphins of the same species, and still more so in those of different species. Thus, not having observed between the teeth of dolphins any essential difference of form, and their differences of number not being determinate, we have nothing but the form of their heads from which to establish the generic differences.

Species I.—*The true Dolphin.**

Delphinus Delphis; L.

Le Dauphin: Bonnaterre; Cétol. 20, pl. x, fig. 2.
Dauphin Vulgaire: Desm. Mammal. sp. 758, p. 514.

[*Called Grampus, Porpess, Herringhog, Dolphin.*]

Hitherto the subjects of our study have been inhabitants of grassy plains, or shady forests; the margins of gentle streams, or the outlets of mighty

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* We call this the *true Dolphin* to distinguish it from the *fish* called dolphin by sailors, (the *coryphæna purpurissa*) and because this species is the dolphin so celebrated in various ancient poems and fables, to which we shall hereafter refer.

rivers: we now turn our attention to creatures whose most congenial dwelling is in the bosom of the ocean.

So admirably are the beings, of which we are now to treat, adapted to an aquatic life, that they present a similarity of appearance to, and are most commonly confounded with *fish*, though this resemblance extends no farther than to the general figure of their bodies, and the modification of structure which fits their extremities for swimming. Language can scarcely convey an idea of the velocity with which they dart through the water, seeming rather to fly than to swim; resembling an arrow impelled by a powerful bow, barely long enough in sight to allow a conviction of its having passed. Of their wonderful celerity of movement, and remarkably playful disposition, we have recently enjoyed many excellent opportunities of observation. Once in particular, on a beautifully clear day, when the sea was so strongly illuminated by the sun as to render objects visible at almost any depth, and our vessel was sailing swiftly before a strong breeze, several of these animals appeared to vie with each other in showing how poor was her speed, compared with their own. As the little troop were merrily gamboling at a short distance from the vessel's side, one of the number would dart immediately in advance of her bow, and swimming with his utmost velocity, would disappear in a straight line before her, and (as the depth at which he swam was not more than three

feet,) would in a minute or two be seen returning to the crew of his comrades, as if in triumph. This was repeated many times, and most probably by different individuals. These dolphins accompanied us for a considerable distance, and all their actions appeared indicative of the most playful and frolicsome disposition.*

They frequently, however, are seen sailing along with a slow and measured motion, just appearing at the surface, by elevating the crown of the head and then diving short, so as to make their bodies describe the arch of a small circle, exposing themselves to view only from the crown of the head, to a short distance behind the dorsal fin. Occasionally

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* "On the 20th of October, 1763, a hundred of these animals approached within pistol shot of our vessel, and appeared to have come expressly for our diversion. They made singular bounds into the air; several of them in their caperings leaped three or four feet above the water, and turned over and over several times, like professed tumblers. They go almost always in troops, and swim as if arranged in battle array: they appear to move in search of the wind. We have always remarked that they swim towards the point whence the wind arises." *Dom. Pernethy*, Hist. d'un voyage aux iles Malouines, 1. p. 97, &c.

"I have seen one playing around the vessel while she was going at the rate of two leagues an hour; the sailors said that it foretold a squall; in fact, one came on at midnight." *St. Pierre, voyage à l'île de France*, p. 52.

In the instance above mentioned, witnessed by the author, the vessel was moving at the rate of eight miles an hour.

a troop of them may be seen scudding along, rising in this manner in quick succession, as if anxious each to get in advance of the other: while again, a single individual may be observed successively rising and falling in the same way, as if engaged in the act of catching a prey.

In this way, shoals of dolphins may be seen almost every day, and at any hour feeding or sporting in the bay and rivers near the city of New York, where we have sometimes enjoyed an opportunity of observing from the wharf, a large shoal of them moving down the Hudson river with the tide. Some plunging along as if in haste, others apparently at play, and others very slowing rising to the surface for breath, and as gradually disappearing, allowing their dorsal fin to remain for a considerable time above the surface.

From the month of May until towards the end of Autumn, the true dolphins frequent the bays and salt water rivers of our country, in great numbers. They are most numerous, and are best observed, during the run of the herring and shad, upon which they doubtless feast abundantly; they appear gradually to diminish in number, as these fish retire from the rivers and coast, though a small party may be occasionally seen very late in the season.

During the month of June, the actions of this animal appear very different from what we have noticed at any other time. They swam in pairs, remained for a longer time at the surface, and seemed

to be borne along by the tide rather than urged forwards by their own volition. They moved in half circles, and lying rather upon their sides, and occasionally lashing the water into foam with their tails —then both disappearing, one in a few seconds would rise at a little distance as if pursued—make a short leap above the surface of the water, and on falling, again commence the same kind of semicircular movement above described, accompanied by the other. We never observed them to show the beauful inferior surface of their bodies at any other period, or to raise the tail fin above the water. But at this season, the whole inferior surface of the body on one side was frequently visible, and the tail occasionally whirled in air, and brought down with great force.

We would have inferred that these movements belonged to their ordinary gambols, was it not for the fact that they all appeared to be paired off, and almost all the pairs seen at this time were similarly occupied. With the exception of a lapse of about three weeks in the month above mentioned, we have never observed them to act in the same manner. During the period referred to, we spent a part of every day in observing them, and have repeatedly been within eight or ten feet of the spot where they were sporting. Occasionally we have watched them for hours, until the force of the tide swept them far beyond our view.

The appearance of a shoal of these animals, at sea, moving in the same direction, is considered by experienced mariners as an indication of an approaching storm, which very certainly follows their appearance. Falconer, in his beautiful poem of the Shipwreck, thus describes such a circumstance:

"Now to the north from burning Afric's shore,
A troop of porpoises their course explore;
In curling wreaths they gambol on the tide,
Now bound aloft, now down the billow glide:
Their tracks awhile the hoary waves retain
That burn in sparkling trails along the main—
These fleetest coursers of the finny race,
When threatening clouds th' ethereal vault deface,
Their route to leeward still sagacious form,
To shun the fury of the approaching storm."

Canto II. § II.

Relative to the breeding season of the dolphin, we have no information sufficiently exact to be relied on. We have seen them in Long Island Sound during the month of August, and the first part of September, accompanied by suckers, varying in size, and from eighteen inches to two feet or more in length. In swimming, or rather in plunging, as heretofore described, the sucker apparently rested on the lateral or humeral fin of the parent, as it always was seen as if adhering to the same place by the side of the parent, in all the movements made in ascending or descending.

A full grown dolphin measures about six feet six inches in length, from the tip of the mouth to the end of the tail, and from the end of the beak to the angles of the mouth the distance is ten and a half inches; and measuring from the same point to the breathing-hole, thirteen inches. The eyes are placed almost precisely on the same line with the angle of the mouth, and are ten and a half inches distant from each other. The lateral or humeral fins are nine and a half inches long, and four broad. The dorsal fin, measured along its anterior edge, is ten inches high; measured along its base, in the direction of the back, it is eight inches. The tail, measured at the extremity of its two lobes, is fourteen inches broad.

The body of the true dolphin is nearly oval, having the dorsal fin to curve backwards at its summit: the beak being flattened and pointed, and containing in both jaws a range of rounded, rather pointed teeth, which project from the sockets about three twelfths of an inch. These teeth are all arranged so as to interlock; and appear to vary according to the sex and age of the animal.* The head of this animal does not project over the beak, but is gradually enlarged backwards, until in a line with the back. The line from the under surface of the lower jaw, is continued with very little change of

* From 84 to 95 upper, from 84 to 95 lower teeth, all of which are regarded as molars.

direction till opposite the dorsal fin, where the body is thickest. From a hand's breadth or more behind the dorsal fin, the body rapidly diminishes to the tail, and on the lower surface, the same rapid diminution takes place from beyond the anus. The tail is composed of two strong lobes terminating in points, which give a beautiful crescent shape, to the extremity of this powerful instrument for swimming.

In examining the anatomical details of this animal, one can not fail to be struck with the singular appearance of the bones forming the lateral fins. We find a shoulder blade, an arm bone, bones of the forearm, wrist and fingers, all so modified as, when covered by the skin, to resemble nothing so much as a fin, yet so obviously analogous to the same bones in the human subject, or in other animals, as to be recognised almost at a glance. The construction of the blow-hole, or breathing apparatus, is also well worthy the peculiar attention of the observer who may have an opportunity of examination, on account of its remarkable excellence of adaptation, and the delicacy of its construction.

The colour of the true dolphin, is of a black or blackish green on the upper surface, and on the inferior parts, of a light gray or whitish. There is below the eye, on each side, a whitish ray or blaze extending towards the humeral fins.

Species II.—*Gladiator Dolphin.*

Delphinus Gladiator.

Schwerdt fisch: Anderson, Island, p. 155.
Poisson à Sabre: Pages voyage au Pole nord, ii. p. 142.
Delphinus dorsi pinna altissima, & Muller, Zool. Dan. Prod. p. 8. n. 57.
Delphinus Maximus: Olafsen, Voy. en Islande.
Dauphin Epée de Mer: Bonnat. Cetol, sp. 5. p. 23.
Dauphin Gladiateur: Lacep. Hist. Nat. des Cetacés, 302. pl. 5, fig. 3.
Dauphin Espadon: Desm. Mammal. sp. 773. p. 517.

This dolphin was first described by Anderson in the work above quoted, and we have very little knowledge of it, except what is derived from him. The head of the gladiator is not highly arched above, but is gradually tapering towards the snout, which is short and as if truncated. Its mouth is furnished with small pointed teeth. Its most remarkable characteristic is a dorsal fin, which is three or four feet high, by eighteen inches wide at its base, slender towards its summit, and recurved towards the tail. Mariners believe that this fin is employed by this dolphin in attacking the whale; but Anderson states "that it is rather the mouth of the animal that is dangerous. As they commonly swim in small troops, they attack the whale in a body, and tear off great pieces of his flesh, until becoming excited to a certain degree, he thrusts out his tongue, when they immediately fasten on this

organ and devour it, and finally, gaining access to his mouth, they destroy the life of the animal." Bonnaterre remarks, that the same author thinks with reason that the cetaceous animals called *Killers*, on the coasts of New England, are of this species. In fact, they have both jaws furnished with teeth which interlock, have on their backs a fin four or five feet high; swim in troops, and attack in a body young whales, just as a pack of dogs attack a bull. Some seize the whale by the tail to prevent him from using this weapon of defence, while the others attack and bite him about the head, until the unwieldy creature becomes fatigued, and thrusts forth the tongue as already stated.

The gladiator dolphin is found on the coasts of Spitzbergen, in Davis's straits, and on the New England coasts. The Chevalier Pagès, on his voyage towards the north pole, found them about the 79th degree of latitude. "The sabre-fish," says he, "are also found among the ice, but they rarely quit the frozen climate near the pole. They are from twenty-three to twenty-five feet long; they are black, and carry their sabre perpendicularly upon the back; this sabre is curved backwards, and is about four feet long. I have seen whales fly from them with the utmost celerity, and I have seen others deeply scarred by the weapon of this warlike animal."*

* Op. cit. apud Bonnaterre Cetologie ut supra.

Species III.—*The Sea-swine.*

Delphinus Phocœna; L.

Delphinus Phocœna: Briss. Régne An. 371, No. 2.
Dauphin Marsouin: Lacep. Cet. 284, pl. 15, fig. 2.
Dauphin Marsouin: Bonnaterre, Cétol, p. 18, sp. 1.

[*Called by the English* Porpus; *by the Dutch* Bruinvisch; *in German* Meerschwein; *by the French* Marsouin.]

We give an account of this species in this place, because authors are in the habit of ranking it among those which frequent our coasts. But we have not been able at any time to learn that the sea-swine has been seen in our waters, or that any other species than those already mentioned are known to our fishermen. The dolphin first described, or true dolphin, is the species universally known by the name of *porpus** in this country, and is at once distinguishable from the European porpus, or sea-swine, by its elongated flattened beak; the latter having a blunt snout, without any beak. If it ever is seen on our coasts, it must be very rare, as we have been thus far unable to find any one who has seen it, except in the seas bordering the shores of Europe. We therefore introduce the description of

* *Porpus* is a corruption of *porc-poisson*, as the French *marsouin* is of the German *meerschwein*.

the species from Bonnaterre, in order that those who have opportunities of observation, may be able to compare the animals and settle the question.

The body of the sea-swine is conical, having a triangular fin on the back. The snout is pointed, and the teeth rounded, trenchant, and enlarged at their summits. The body of this animal is round, thick, and tapering towards the tail. The head represents an obtuse cone, which is much arched above the orbits of the eyes: it thence gradually tapers down to the snout. The eyes are situated opposite the opening of the mouth: the pupil is black, surrounded with a white iris. Both jaws are nearly of the same length; the lower one being armed on each side with a range of small teeth, which are slender at the base, flattened, trenchant, and rounded at the summit; varying in number from fifty to fifty-five. Behind the eye is a small round hole, an inch in diameter; this is the ear. The blow-hole is situated upon the summit of the head, in the centre of the interval between the eyes and angle of the mouth. The nostrils are placed between the blow-holes and the extremity of the muzzle. The lateral fins are placed upon the borders of the lower surface of the body: the dorsal fin occupies the middle of the back. Behind this fin the back is flattened and raised in the middle by a projection which extends entirely to the caudal fin. On the part of the belly corresponding to the dorsal fin, there is a depression which conceals the sexual organs. The

vent is equi-distant from the depression and the caudal fin. The caudal fin is formed of two lobes rounded at the points, and slightly grooved. The colour of the whole superior surface is of a blackish blue: the belly whitish. The length from six to eight feet.

This animal, which is considered an excellent swimmer, habitually carries the head and tail curved downwards, and in consequence, shows nothing but the back when it comes to the surface to breathe; but as soon as it is dead, it extends itself in a straight line. They feed on small fish, which they pursue with inconceivable swiftness. The sea-swine are almost always seen in troops, especially in their sexual season, which is in the month of August. It is then common to see ten or fifteen males in pursuit of a single female, and they press on with so much ardour, that they are often stranded on the beach before they are aware of their situation. The young are carried ten months; only one is brought forth at a time. An embrion, extracted from the mother by Klein, was about twenty-one inches long. The young one constantly follows the mother until weaned.

The flesh of this animal is oily and disagreeable. The Laplanders, Greenlanders, and others eat it. In some parts of the world, they are killed for the sake of their oil and skins.

Fabulous History of the Dolphin.

Few animals have occupied a more distinguished place in the writings of historians and poets, than the dolphin, whose actual habits and manners we have just examined. From Herodotus, the father of Greek historians, down to a comparatively recent period, we find a succession of wonderful incidents related, originating either from the most inaccurate observation of fact, or from the wildest extravagance of fancy.

It will be an amusing, and we hope not an uninstructive lesson, to trace some of the most remarkable of these stories, both to show how far the human mind may permit itself to be misled, and to set at rest, by exposing their futility, such recitals as the beauty and excellence of poetry tend to perpetuate as probable or true. Investigations of this kind may in some degree lessen the pleasure derived from works of fiction, but the advantage of being possessed of the truth, far outweighs the temporary gratification arising from an indulged imagination.

The most ancient of the accounts given of the docility and friendly disposition of the dolphin, is that related of Arion, by Herodotus in his first book. As this may be considered the source from which most of the others have sprung, we subjoin a free translation from the venerable historian.

"Periander was king of Corinth. The Corinthians relate, (and the Lesbians agree with them,) that during his life-time, a great prodigy occurred. They say that Arion was carried from Methymna to Tænarus upon the back of a dolphin: as a musician, he was second to none, as a dithyrambist, we know he was the first, composing, giving rules and teaching at Corinth. Having spent much of his time with Periander, he desired to visit Sicily; having acquired much wealth there he wished to go back to Corinth, for which purpose he hired a vessel from some Corinthians at Tarentum. When at sea, they conspired to throw him overboard, that they might share his money; which having learned, he earnestly besought them to take his wealth, but spare his life. But they, unmoved by his entreaties, ordered him either to kill himself, and perchance obtain a burial on shore, or to cast himself instantly into the sea.

"Driven to despair, Arion besought them, since it was thus determined, that they would allow him to sing, standing completely arrayed on the deck. They promised him that he might die singing, and pleased that they should hear the most excellent of musicians, they removed from the poop towards the middle of the ship. Arion, clad in his professional robes,* took his lyre, and, standing on the deck, ran

* Εν τη χεινη παση is rendered by Dalzell, "completely arrayed," as we have given the phrase in the second para-

through the Orthian measure.* Having concluded, he threw himself into the sea, and they sailed on from Corinth. But Arion, sitting on a dolphin's back, was conveyed to Tænarus, &c. &c. These things are still told by the Corinthians and Lesbians. There is a small brazen votive tablet of Arion near Tænarus, of a man mounted upon a dolphin's back.†

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graph. Murphy says it was not his ordinary dress he wished to die in, but one peculiar to him as a musician.

* So called, because sung at the highest and strongest pitch of the voice. "Ορθιον enim Græci dicunt quod arduum est, et quam altissima voce elevatum.—*Casnerus.*

† Herodotus, ἐς γῆν Κλεωνάς.—This story did not escape the biting irony of Lucian, whose talent for ridicule has rarely been surpassed. He has a dialogue between Neptune and the very dolphin who bore Arion in safety to Tænarus, and makes him repeat Herodotus's story, as "having heard the whole of it while swimming round the ship." Lucian also accounts for the fabled attachment of the Dolphin to the human race, by making this one remind Neptune that they were changed from *men* to dolphins by Bacchus. Ovid relates the transformation in his third book of Metamorphoses, where Bacchus himself, in the semblance of his companion Acætes, is the speaker:—

"At Lybis obstantes dum vult obvertere remos,
In spatium resilire manus breve vidit; et illas
Jam non esse manus jam primas posse vocari.
Alter ad intortos cupiens dare brachia funes
Corpore desiluit; falcatæ novissima cauda est
Qualia dimidiæ sinuantur cornua lunæ."

The sagacious and judicious Plutarch not only repeats this story, but introduces Gorgias in the conversation of the seven wise men, as saying, that he knew Arion, before he landed from off the dolphin's back, because he had on the dress he had worn at the public games. Aulus Gellius repeats the story from Herodotus, as it was originally told, and Ovid perpetuates it in verse.*

"Numerous examples, (says Aristotle,) of the gentleness and mild manners of dolphins are related. About Tarentum, Caria and other places, they tell of their love and regard for boys. A dolphin having been wounded near Caria, a troop of dolphins, it is said, gathered in the port, until the fish-

* Ille metu vacuus, mortem non deprecor inquit;
Sed liceat sumta pauca referre lyra,
Dant veniam, fidentque moram: capit ille coronam,
Quæ possit crines, Phœbe, decere tuos.
Induerat Tyrio bis tinctam murice pallam:
Reddidit icta suos pollice chorda sonos;
Flebilibus veluti numeris canentia dura
Trajectus penna tempora cantat olor.
Protinus in medias ornatus desilit undas,
Spargitur impulsa cærula puppis aqua.
Inde, fide majus testo, Delphina recurvo
Se memorant oneri supposuisse novo.
Ille sedens citharamque tenet, pretiumque vehendi,
Cantat, et æquoreas carmine mulcet aquas.
Di pia facta vident: astris Delphina recepit
Jupiter, et stellas jussit habere novem.

erman set his prisoner at liberty, when they all went off. A larger dolphin likewise always accompanies them as a guard. A troop of dolphins of larger and smaller size, were once seen, and, at no great distance behind them, two dolphins appeared, bearing up the body of a young dead dolphin on their backs, by swimming beneath it, as if induced by pity lest it should be devoured by some beast.*

Œlian relates in the third chapter of his eighth book, that Ceranus, the Parian, purchased the freedom of some dolphins caught by Byzantine fishermen, and afterwards sailed towards his own country in a Milesian vessel of fifty oars. His vessel was cast away in the strait of Parbs, but these dolphins which he had set at liberty, came in time to save their deliverer, and landed him on a promontory, subsequently called Cerania, in honour of him; at his death, he requested to be interred at that place; thither the dolphins went to pay their benefactor merited funeral honours.

Leonidas of Byzantium, narrates (in Œlian's 2d book, ch. 6,) that a man and his wife of Pleroselene, taught a dolphin to eat from their hands, and accustomed their son to be very familiar with the animal; which very regularly frequented the harbour of the town, appearing to regard it as his home. When old enough to take care of himself, he sought

* Aristoteles de Animalibus Historiæ, lib. ix. cap. 35.

his subsistence at sea, and brought a share of his success in fishing daily to his friends. The parents had given the same name to the dolphin and their son. When the boy sat upon a projecting rock, and called his friend, the dolphin immediately hastened towards him, testifying his pleasure by his frolicsome movements. This connection between the boy and dolphin, occasioned a great deal of rumour, and was very profitable to the parents.*

The younger Pliny, however, exceeds all these wonders, by the following recital. A scholar, named Hippus, in the time of Augustus, who attended a class at Puzzoli, was in the habit of going daily along the shores of Baia, and about mid-day, of stopping and throwing pieces of bread into the water to a dolphin. If the youth called the dolphin at any time, he would immediately come, and after eating his bread, would offer his back for the use of his friend who would mount thereon, and he would swim with him to Puzzoli, and afterwards carry him back in the same manner. This friendly intercourse was maintained for several years; but

* There is nothing improbable in the dolphin's obedience to a certain call from one accustomed to supply it with food. Animals of very inferior rank to the dolphin, may be taught as much. The improbability, is in the gratitude of the animal, evinced by the offer of part of his fish.

the boy dying, the afflicted animal came frequently to the accustomed place, remained there sorrowful and wretched, and finally died of grief!*

The reasons for believing the present species to be *the* dolphin of the poets, are the following: first, it is the only dolphin which is known habitually to frequent the coasts, or to visit the deep bays which extend far inland. The sea-swine (meerschwein, marsouin, *Delphinus Phocæna,*) have no beak extending beyond the arched part of the head, and as they are seldom seen except in the full sea, are not likely to have afforded much opportunity to the ancients for examination. That they were well acquainted with our dolphin, we have the most excellent evidence, in the figure of the one which accompanies the statue of the Venus de Medicis. Although the usual poetical licence has been taken by the sculptor, of placing the animal resting on the underjaw and neck, with its body and tail raised in fanciful undulations, from the great resemblance of the head and beak to those of the dolphin we have been examining, in conjunction with the circumstances of its habits, numbers and familiarity with the bays and rivers of almost all the world, we are persuaded of the identity of the species frequenting our waters, with that to which all the ancient fables relate.

* See Pliny, lib. ix, cap. viii.

We have thought it unnecessary to bring the fabulous history of the dolphin down to a later period than that of Pliny, as all the subsequent stories appear to be variations of the same. It is impossible, however, not to feel sorry that some modern works of great authority and usefulness, continue to interweave so much of what is barely *possible*, with the little that is attested in regard to this and other animals, as to give an air of fable to the whole. The following from the "Nouveau Dictionnaire d'Histoire Naturelle," may serve as an instance.

"The dolphins form among themselves a sort of society; they defend those of the troop that may be attacked, and utter frightful cries, in order to induce the aggressors to release them. The little dolphins are placed in the middle of the troop; the large and most robust at its head: they all preserve their order like a battalion of soldiers; they swim each in their ranks; the females compose the rear guard, and urge on the stragglers."*

This is not the only passage of the kind, that might be selected from the article on the dolphin, in the same work. If the time shall ever arrive, when the facts of natural history are given, without admixture with fable, the world will be more rapidly and satisfactorily advanced in improvement than can possibly be hoped for, so long as imagination

* Virey op. citato.

is permitted to usurp the place of truth. The latter, like perfect beauty, is unsusceptible of adornment, and is always more admirable in its simplicity than any fiction, however ingeniously contrived or gorgeously ornamented.

CHAPTER VIII.

Genus Narwal; *Monodon*; L.

GENERIC CHARACTERS.

General form of the body similar to that of the dolphin; a single spiracle or blowhole on the superior part of the head; mouth small: no teeth within the mouth, one long spiral tusk growing from the intermaxillary bone; dorsal crest or spine, instead of a fin. The eyes and ears small.*

Species I.—*The Narwal.*

Monodon Monoceros; L.

Monodon Narwhale Fabricius, Faun. Groenl. 29.
Narwhal oder einhorn. Anderson, Island. 224.
Narwhale Bonnat. Cotol. 10.
Narwhal Eulamei. Lacep. Hist. Nat. des Cétacés, 142.
Narwhal, or Unicorn of the Whalers. Scoresby, Arct. Regions, i. 486.
Irid. Voyage to Greenland, 122.

[*Commonly called Sea-Unicorn.*]

The narwal is an inhabitant of the arctic seas, and consequently is seldom seen, except by the ad-

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* "Penis vaginatus; mammæ lactantes binæ et genitalia feminarum sub abdomine; pone illa anus." *Bonnat.*

venturous mariners, who seek the spoils of the whale amid the perils of polar ice and storms. Fortunately, however, some few of these, incited by hopes of gain to visit those forbidding regions, have been well qualified to make accurate scientific observations, and owing to their zealous industry, we have actually less to desire concerning the animals found in the icy seas, than in relation to many others, almost within the reach of every observer.

Among the individuals to whom science is most deeply indebted, the name of SCORESBY must ever stand conspicuous; few persons have contributed so largely to the advancement of natural history, while engaged in ordinary commercial pursuits, and still fewer have effected the object so well under any circumstances. His mind appears to have been one of that rare, but amiable composition, in which genius, talent, energy and sound common sense, are blended in such just proportion, as to be capable of operating at all times, and upon all materials, to the greatest possible advantage. From his valuable researches we shall derive almost all the observations which remain to be made upon the cetaceous animals, claiming for ourselves no other merit than that of having collected and arranged them.

The vertebral column of the narwal is about twelve feet long; there are seven cervical, twelve dorsal, and thirty-five lumbar and caudal vertebræ, being in all fifty-four; twelve of which enter the tail and extend to within an inch of its extremity. The

spina marrow runs through all the vertebræ, from the head of the fortieth, but does not penetrate the forty-first. The spinous processes diminish in length from the fifteenth lumbar vertebræ, until it is scarcely perceptible at the nineteenth. Large processes, attached to two adjoining vertebræ, and arising from the inferior surface of the bodies of the vertebræ, commence between the thirtieth and thirty-first, and terminate between the forty-second and forty-third. There are twelve ribs, six true and six false, on each side, which are slender for the size of the animal. The sternum is heart-shaped, with the broadest part anteriorly. Two of the false ribs, on each side, are joined by cartilages to the sixth true rib, the others are detached.

The narwal, when full grown, measures from thirteen to sixteen feet in length, exclusive of the tusk, and at the thickest part, which is two feet behind the fins, the circumference is about eight or nine feet. The part of the body anterior to the fins and head, are paraboloidal; the middle portion of body is almost cylindrical, the posterior portion, to within three or four feet of the tail, is somewhat conical; thence, a ridge commencing both at the back and belly, the section becomes first an ellipse, and then a rhombus at the junction of the tail. The perpendicular diameter, at a distance of twelve or fourteen inches from the tail, is about one foot, the transverse diameter is about seven inches. The back and belly ridges, run half way or more across the tail;

the edges of the tail run in the same way along the body, and form ridges on the sides of the rump. Posterior to a very slight elevation at the spiracle, the outline of the back forms a regular curve; the belly appears to rise, or is contracted near the vent, and expands to an obvious bump, about two feet anterior to the genitals. The back appears depressed and flat three or four feet posterior to the neck.

The head forms about one seventh of the whole length of the animal, being small, blunt, and round. The mouth is small, and incapable of much extension, having a wedge-shaped underlip. The eyes are only one inch in their largest diameter, and are placed on a line with the opening of the mouth, at about thirteen inches from the snout. The opening of the ear, situated six inches behind the eye, on the same horizontal line, is of the diameter of a small knitting needle. The scull of the narwal, like the dolphin, &c. is concave above, and sends forth a large, flat, wedge shaped process in front, which affords sockets for the tusks. There is upon this process a bed of fat extending horizontally to the thickness of ten or twelve inches, and eight or ten perpendicularly. To this fat, the roundness of the head is owing, and according to the quantity present, is the prominence of the front, and the variation of the facial angle, from 60 to 90 degrees.

The spiracle or blowhole is situated immediately over the eyes, and is a single semicircular opening about three and a half inches in diameter and one

inch and a half in length. It expands immediately within the skin into a sac or air vessel, six or eight inches wide, and extending laterally and forward, into two cavities, one on each side; the extremities of which, are about twelve inches apart. These contain some mucous matter; the lining of the whole sac is a thin, greenish, black membrane. At the posterior extremity of the sac, the blowholes are seen, divided there, into two distinct canals in the skull. They are closed by a valve resembling a hare lip, one lobe of which covers each canal. This valve in the narwal, does not, (as in the whale), enter the canal in the skull, but merely closes down upon it. It, however, effectually excludes the sea-water from the lungs, whatever be the pressure; it becomes, in fact, firmer and closer, in proportion as the weight of water is increased. The valve is about six inches wide and is closed and opened by two radiated muscles. It is detached from the skull beneath, about six inches towards the snout. In consequence of this separation, the valve is sufficiently free, and has room enough in the adjoining sac to be drawn upward and forward, so as to expose the breathing canals, or falling upon them like the valve of a pump-box, to secure them against the entrance of water. The two lobes of the valve are connected by a fleshy septum, slightly attached to the cartilaginous part of the bony partition between the blow-holes in the skull.

The fins are twelve or fourteen inches long, and six or eight broad, and placed at one fifth of the length of the animal from the snout. Where fixed to the body, the fin is elliptical, its longest axis lying longitudinally, so that when the fin is elevated to the swimming position, it is horizontal, the point or tip is bent upwards or towards the back, consequently, when the fin is in the swimming position, it is concave above, and convex below, the thick edge forward and the thin edge towards the tail. The fin being horizontal, is evidently designed to balance the animal, while the tail, which is from fifteen to twenty inches long, and three or four feet broad, is the chief organ of motion, and is also used in turning. That the fins are not commonly used either for swimming or turning, appears probable from repeated observations made with a telescope from the mast head. The fins were always seen steadily extended, and when the animal changed its direction, the tail was bent suddenly and obliquely to one side, and then slowly brought back, so that the progressive motion and change of direction were produced by the same effort; the fin at the same time remaining motionless.

The general colour of the young narwal is blackish gray on the back, variegated with numerous darker [illegible] running into each other and forming a dusky [illegible] surface, paler and more open spots of gray on a white ground at the sides, disappearing altogether about the middle of the belly. In the

elder animals, the ground is wholly white, or yellowish white, with dark gray or blackish spots of different degrees of intensity. These spots are of a roundish or oblong form: on the back, where they seldom exceed two inches in diameter, they are the darkest and most crowded together, yet with intervals of pure white among them. On the sides, the spots are fainter, smaller and more open. On the belly they are extremely faint and few, and being in considerable surfaces, are not distinguishable. A close patch of brownish black, without any white, is often found on the upper part of the neck, just behind the blowhole: the external part of the fins is also generally black at the edges, but grayish about the middle. The superior side of the tail is also blackish around the edges: but in the middle, gray with black curvilinear streaks, on a white ground, forming semicircular figures on each lobe. The inferior surfaces of the fins and tail are similar to the upper, only much paler coloured, the middle of the fins being white, and of the tail a pale gray. The sucker narwals are almost uniformly of a bluish gray or slate colour. Very old individuals become almost white.

The skin of the narwal, resembles that of the whale, except that it is thinner. The cuticle is about as thick as writing paper; the rete mucosum three eighths or three tenths of an inch thick; the cutis thin, but strong and compact on the outer side.

We may next consider the most remarkable peculiarity which distinguishes this animal; the long spiral tooth or tusk, which has obtained for it the name of UNICORN. This tusk grows from the left side of the head, and is sometimes nine or ten feet long. EGEDE, in his description of Greenland, describes this tusk as being fourteen or fifteen feet long. It projects from the inferior part of the upper jaw, and points forward and slightly downward, being parallel in direction to the roof of the mouth. It is spirally striated from right to left, nearly straight, and tapers to a round blunt point. It is of a yellowish white colour, and consists of a compact kind of ivory, and is usually hollow from the base to within a few inches of the point. A tusk of the average length, five feet, is about two inches and a half in diameter at the base; one inch and three fourths in the middle, and about three eighths within an inch of the end. In such a tusk there are five or six turns of the spiral, extending from the base to within six or seven inches of the point. Beyond this, the end is not striated, but smooth, clean, and white; the striated part is usually gray and dirty. The tusk is commonly covered with a greasy blackish brown incrustation over the greatest part of its surface; the under part and a few inches of the point, are kept quite clear and polished by some use which prevents the adherence of the matter just mentioned. A horn externally of seven feet in length, is bedded about fifteen or

sixteen inches in the skull. All the male narwals, killed by Scoresby, excepting one, had tusks of from three to seven feet in length, projecting from the left side of the head.

In addition to this external tusk, peculiar to the male,* there is another on the right side of the head about nine inches long, imbedded in the skull. In females as well as in young males, in which the tooth does not appear externally, the rudiments of two tusks are generally found in the upper jaw. These are entirely solid, and are placed back in the substance of the skull, about six inches from its most prominent part. These rudiments of tusks are eight or nine inches long, both in the male and female; in the former they are smooth, tapering, and terminate at the root with an oblique truncation; in the latter they have an extremely rough surface, and finish at the base with a large irregular knob placed towards one side, which gives the tusks something of the form of pocket-pistols. Two or three instances have occurred of male narwals having

* Scoresby, in his Greenland voyage, killed a female narwal, having an external horn, four feet three inches long; twelve inches of which were imbedded in the skull. It had also a milk tusk, as is usual, nine inches long, which was of a conical form and obliquely truncated at the thicker end, and without the knob found in many of the milk tusks. The horn was on the left side of the head, and the spiral was *dextrorsal*.

been taken, which had two external tusks. This is a rare circumstance, and it rarely or never occurs that an external horn is found on the right side.

What purpose this singular and formidable tusk can serve, is not easily to be determined. It is not essential to the defence of the animal, or else the young and a vast majority of the females would be left unprotected. It has been suggested, that it is employed by the animal in piercing thin ice for the convenience of rising to respire, and that it is occasionally employed in killing prey. But nothing has yet been observed, sufficient to enable us to draw any positive conclusion on the subject.

The food of the narwal appears to be principally molluscous animals, such as the cuttle-fish &c., but judging by the materials occasionally found in their stomachs, more substantial food is frequently devoured by them. In the stomach of one examined by Scoresby, besides the beaks and other remains of cuttle-fish, there was part of the spine of a *pleuronectes*, or flat-fish, probably a small turbot; fragments of the spine of a *gadus;* the backbone of a *raia*, with nearly a whole skate, *raia-batis*, which was two feet three inches long, and one foot eight inches broad. That an animal having no teeth except the external tusk, a small mouth, and a tongue incapable of protrusion, should be able to swallow a fish nearly three times as great as the width of its own mouth, is really surprising. Scoresby inclines to the opinion, that the skates had been

pierced with the horn, and killed before they were swallowed by the narwal, as it is otherwise very difficult to conceive how an animal so large as the skate, would allow itself to be sucked down the throat of a smooth-mouthed animal, having no means of crushing or detaining it.

The narwal is a harmless animal, of an active disposition, and swims with considerable swiftness. When at the surface, for the sake of respiring, these animals frequently lie motionless for several minutes, with their heads and backs just appearing above water. Occasionally, numerous small herds are seen together, each herd generally consisting of individuals of the same sex.

The narwal is sometimes shot with a rifle, kept for that purpose in the *crow's-nest* of the whaling-ships. When harpooned, the narwal dives as swiftly, but not so deeply as the common whale. It commonly descends about two hundred fathoms, and then returns to the surface, where it is soon killed with lances.

The whole body of the narwal is covered by a layer of blubber immediately beneath the skin, which is from two to three inches thick, and yields a considerable quantity of fine oil. The Greenlanders and Esquimaux employ the whole animal to various uses. The flesh is eaten, the oil burned in their lamps, the intestines wrought into lines and dresses, and the tusks are used for spears &c. It

is said that the king of Denmark has a magnificent and valuable throne made entirely of narwal tusks.

The following are the dimensions of a male narwal, killed by Scoresby near Spitzbergen in 1817.

	Feet	Inches.
Length, exclusive of the tusk,	15	0
——— from the snout to the eyes,	1	1½
——— fins,	3	1
——— backridge,	6	0
——— vent,	9	0
Circumference 4½ inches from snout,	3	5
——— at the eyes and blowhole,	5	3½
——— just before the fins,	7	5
——— at the forepart of backridge,	8	5
——— at the vent	5	8
Tusk, length externally,	5	0½
——— diameter at base,	0	2½
Blowhole length 1½ inch. breadth,	0	3½
Tail do 14 do	3	0½
Fins do 13 do	0	7½

Heart weighed 11 pounds. Temperature of the blood an hour after death, 97°.

A fine specimen of the tusk or horn of the narwal may be seen in the Philadelphia Museum.

CHAPTER X.

Section II.—*Size of the head disproportioned to that of the body.*

Genus Cachalot; *Physeter*: L.

GENERIC CHARACTERS.

The head in these animals is of huge size, forming a third, or even half of their entire length. The upper is broad, high, destitute of corneous fringes and teeth, or having short teeth, almost entirely concealed within the gums. The lower jaw is elongated, narrow, and armed with thick conical teeth, which fit into corresponding depressions in the upper jaw. The spiracles are placed at or near the extremity of the superior part of the snout. There is a dorsal fin in some species, in others merely an eminence. In the superior parts of the head there are large cavities, circumscribed by cartilaginous partitions, and communicating with different parts of the body by particular canals. These are filled with an oil that becomes fixed and crystallized on cooling, and is the well known substance spermaceti.

The teeth are ovoid and recurved; externally they somewhat resemble ivory, internally they are softer, and ash coloured. They are commonly about six

inches long, and three in circumference at the base, and are thought to become larger and more recurved as the animal grows. The upper jaw has as many alveolar depressions as there are teeth in the lower, but what is most remarkable, is, that in the interstices separating these depressions, are to be found about twenty small teeth, horizontally placed, and raised about one-twentieth of an inch above the gum. These teeth are acutely pointed, and present a flat, even, and oblique surface, filling the intervals separating the alveoles. This oblique surface is all that is seen of them, the other parts of these teeth being imbedded in the gum.*

SPECIES I.—*The Spermaceti Cachalot.*

Physeter Macrocephalus.

Le Grand Cachalot, BONNAT. Cétol. 12.
Cachalot Macrocéphale, DESM. Mam. 524, p. 790.
Cachalot Macrocéphale, LACEP. Hist. Nat. des Cétacés, pl. 10.

The spermaceti cachalot is found in greatest abundance in the Pacific Ocean, where large numbers of them are annually killed by the American and other whalers, for the sake of their oil and spermaceti.

The spermaceti cachalot is gregarious, and herds

* See Desmarest's Mammalogie; Bonnaterre Cétologie; and Phalainologia nova.

are frequently seen containing two hundred or more individuals. Such herds, with the exception of two or three old males, are composed of females, who appear to be under the direction of the males. The males are distinguished by the whalers as *bulls;* the females they call *cows.* The bulls attack with great violence, and inflict dreadful injuries upon other males of the species, which attempt to join their herd. These animals live separately, while young, according to their age and sex. The young and half grown males are found by themselves; the old *cows* protect the young females. When the young bulls attain sufficient strength, they venture into a herd under the protection of some old bulls, an intrusion that is said to produce a severe contest, by which they succeed in gaining admittance to, or are driven from the herd.

The mode of attacking these animals is as follows:—Whenever a number of them are seen, four boats, each provided with two or three lines, two harpoons, four lances and a crew of six men, proceed in pursuit, and, if possible, each boat strikes or "fastens to" a distinct animal, and each crew kill their own. When engaged in distant pursuit, the harpooner generally steers the boat, and in such cases the proper boat steerer occasionally strikes, but the harpooner mostly kills it. If one cachalot of a herd is struck, it commonly takes the lead and is followed by the rest. The one which is struck, seldom descends far under water, but goes

rally swims off with great rapidity, stopping after a short course, so that the boat can be drawn up to it by the line, or be rowed sufficiently near to lance it. In the agonies of death, the struggles of the animal are truly tremendous, and the surface of the ocean is lashed into foam by the motions of the fins and tail. Tall jets of blood are discharged from the blowholes, which show that the wounds have taken mortal effect, and seeing this, the boats are kept aloof, lest they should be dashed to pieces by the violent efforts of the victim.

When a herd is attacked in this way, ten or twelve of the number are killed; those which are only wounded are rarely captured. After the cachalot is killed, the boats tow it to the side of the ship, and if the weather be fine, and other objects of chase in view, they are again sent to the attack.

The separation of the blubber from the animal, or "flensing," is sometimes done differently from the manner used in the polar whaling. A strap of blubber is cut in a spiral direction, and being raised by tackles, turns the cachalot round as on an axis, until nearly all the blubber is stripped off. The material contained within the head, consisting of spermaceti mixed with oil, being in a fluid state while warm, is taken out of large cachalots in buckets, while the animal remains in the water; but in smaller ones, the part of the head containing the spermaceti, is hoisted upon deck before the cavity is opened.

The substances taken from the head, congealing as soon as cold, the compound is thrown in its crude state into casks, and is purified at the end of the voyage on shore. The oil is reduced from the blubber shortly after it is on board, in "try works," with which the ships engaged in this business are always provided. There are two coppers in the try works, placed side by side, near the fore hatch. These, with their furnaces and casing of brickwork, occupy a space of five or six feet in length, by eight or nine in breadth, (or fore and aft—and athwart ship,) and four or five feet in height. The cavity of the brick arches sustaining the coppers and furnaces, forms a water cistern, so that while the fire is burning, the deck is secured from injury by the changing of the water in the cistern twice or thrice in every watch. As the oil is extracted it is thrown into coolers, whence, after about twenty-four hours, it is transferred to casks. At first the coppers are heated with wood, but afterwards the cracklings or fritters of the blubber, which still contain some oil, are employed as fuel, and produce a fierce fire. About three tons of oil are commonly obtained from a large cachalot of this species; from one to two tons are procured from a small one. A cargo, produced from one hundred cachalots, may be from 150 to 200 tons of oil, besides the spermaceti, &c.

CHAPTER IX.

Genus—Whale; *Balæna;* L.

GENERIC CHARACTERS.

Whales possess no true teeth; the upper jaw resembles the keel of a vessel, or the roof of a house reversed. It is furnished on each side with transverse horny layers of a peculiar substance, called *Baleen,* which at the edges are split into long slender fringes. The spiracles or blowholes are separated, and placed about the middle of the superior part of the head. Some species have a dorsal fin; others merely a prominence.

Species I.—*The Whale.*

Balæna Mysticetus. L.

Φαλαινα Arist. An. l. c. v. III. c. xvi. Μυστικητος, ib. III. c. x. Æl. Hist. an. v. c. iv.
Hvalfisch; Egede Greenland, 48.
La Baleine Franche; Bonnat. Cétol. 1.
The Common or Greenland Whale; Scoresby Arct. Regions, i. 449.

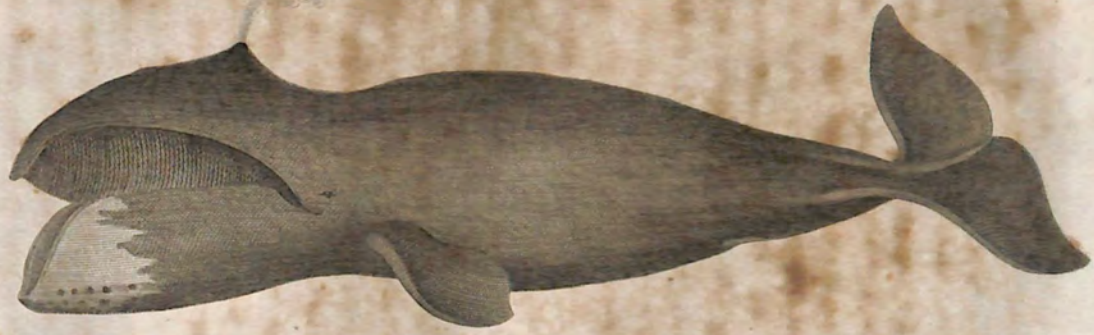
In attempting to describe a creature so gigantic and surpassing in strength as the whale, we deeply feel the want of expressions suitable to our purpose, and vainly endeavour to remove this difficulty

ROYAL ARCTIC SOCIETY

BALÆNA MYSTICETUS, or COMMON WHALE

58 Feet long

The Mouth being open shows the position of the Whalebone



Drawn by W. Scoresby Jun.r

Scale, one-tenth of Inch to a foot.

W. E. Tucker Sc.

by resorting to comparisons scarcely less inadequate, or conveying at best but vague and unsatisfactory ideas. The sublime in magnitude among organized and animated beings, the whale is adapted in all his attributes to the fathomless and illimitable waters he is destined to inhabit: contrasted with other animals, his strength as far transcends their greatest exertions, as the irresistible heavings of the mighty deep exceed the harmless rippling of a sylvan stream. It is only by successive approaches and detailed examination, that we can arrive at a proper conception of this animal, and, therefore, the statements which are freest from attempts to emulate by ambitious style the magnitude of the subject, will lead us to the most satisfactory conclusions.

Having never personally enjoyed opportunities of studying the whale in his native floods, and having derived all that we know in relation thereto, from Scoresby, we should deem it injustice to the reader to give this account in any other language than that of the original. We do this without reluctance, as our object is to convey the most accurate knowledge, rather than to produce a work exclusively of our own composition, and because we believe that where an original observer is competent to express what he has seen, his remarks must have a force and value far greater than can be imparted by another, however great may be his command of language, or his felicity of expression. All that

follows in relation to the whale, is selected from the different works of the accurate and philosophical SCORESBY.

The Whale.

This valuable and interesting animal, generally called the whale by way of eminence, is the object of our most important commerce to the polar seas—is productive of more oil than any other of the cetacea, and being less active, slower in its motion, and more timid than any other of the kind, of similar or nearly similar magnitude, is more easily captured.

Large as the size of the whale certainly is, it has been much over-rated; for such is the avidity with which the human mind receives communications of the marvellous, and such the interest attached to those researches, which describe any remote and extraordinary production of nature, that the judgment of the traveller receives a bias, which, in cases of doubt, induces him to fix upon that extreme point in his opinion, which is calculated to afford the greatest surprise and interest. Hence, if he perceives an animal remarkable for its minuteness, he is inclined to compare it with something still more minute: if remarkable for its bigness, with something fully larger. When the animal inhabits an element where he can not examine it, or is seen under any circumstance which prevent the possibility of his determining its dimensions, his decision will certainly be in that extreme which excites the most

interest. Thus a mistake in the size of the whale would easily be made; and there is every probability of such an error having been committed two or three centuries back, from which period some of our present dimensions have been derived, when we know that whales were usually viewed with superstitious dread, and their magnitude and powers in consequence, highly exaggerated. Besides, errors of this kind having a tendency to increase, rather than to correct one another, from the circumstance of each writer on the subject, being influenced by a similar bias; the most gross and extravagant results are at length obtained. Thus authors, we find, of the first respectability in the present day, give a length of 80 or 100 feet, or upwards, to the mysticetus, and remark with unqualified assertion, that when the captures were less frequent, and the animals had sufficient time to attain their full growth, specimens were found of 150 to 200 feet in length, or even longer; and some ancient naturalists, indeed, have gone so far, as to assert that whales had been seen of above 900 feet in length.

But whales in the present day are by no means so bulky. Of 332 individuals, in the capture of which, I have been personally concerned, no one I believe exceeded 70 feet in length; and the largest I ever measured, was 58 feet from one extremity to the other, being one of the longest to appearance, which I ever saw. An uncommon whale, which was caught near Spitsbergen, about twenty years ago, the whalebone of which measured almost fifteen feet,

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was not, I understand, so much as 70 feet in length; and the longest actual measurement that I have met with, or heard of, is given by Sir Charles Giesecke, who informs us, that in the Spring of 1813, a whale was killed at Godharn, of the length of 67 feet; these however are very uncommon instances. I therefore conceive that 60 feet may be considered as the size of the largest animals of this species, and 65 feet in length as a magnitude which very rarely occurs.

Yet I believe that whales now occur of as large dimensions as at any former period, since the commencement of the whale fishery. This point I endeavoured to prove, from various historical records, in a paper, read before the Wernerian Society, on the 19th day of December, 1818, and since inserted in the Edinburgh Philosophical Journal, No. 1. p. 83.

In this paper, I brought forward the authorities of Zorgdrager, the writer of an account of the whale fishery, and one of the early superintendents of the Dutch northern fisheries, together with opinions or remarks of Captain Anderson, Gray, Heley, and others, who were among the earliest of the English whalers, which satisfactorily prove, that the average and largest produce of a whale in oil, was not greater near two hundred years ago, than it is at the present time; and to these are added the testimonies of Captain Jenkinson and Edge, as to the length of the whale, which likewise corresponds pretty nearly with the measurements I have myself made.

Jenkinson, in his voyage to Russia, performed in 1557, saw a number of whales, some of which, by estimation, were 60 feet long, and are described as being "very monstrous." Edge, who was one of the Russia Company's chief and earliest whale fishers, having been ten years to Spitsbergen, prior to the year 1625, calls the whale "a sea beaste of hughe bigness, about 65 foot long, and 35 foot thick," having whalebone ten or eleven feet long, (a common size at present) and yielding about 100 hogsheads of oil; and in a descriptive plate, accompanying Captain Edge's paper on the fishery, published by Purchas in 1625, is a sketch of a whale, with this remark subjoined—"a whale is ordinarily about 60 foot long."

Hence, I conceive, we may satisfactorily conclude that whales of as large size are found now, as at any former period, since the Spitsbergen fishery was discovered; and I may also remark, that where any respectable authority affords actual measurement exceeding 70 feet, it will always be found that the specimen referred to, was not one of the mysticetus kind, but of B. Physalis or the B. Musculus animals, which considerably exceed in length any of the common whales that I have either heard of, or met with.

When fully grown, therefore, the length of the whale may be stated as varying from 50 to 65, and rarely, if ever, reaching 70 feet; and its greatest circumference from 30 to 40 feet. It is thickest a little behind the fins, or in the middle between

the anterior and posterior extremes of the animal; from whence it gradually tapers, in a conical form, towards the tail, and slightly towards the head. Its form is cylindrical from the neck to within ten feet of the tail, beyond which, it becomes somewhat quadrangular, the greatest ridge being upwards, or on the back, and running backward nearly across the middle of the tail. The head has somewhat of a triangular shape. The under part, the arched outline of which is given by the jaw bones, is flat, and measures 16 to 20 feet in length, and 10 to 12 feet in breadth. The lips, extending 15 or 20 feet in length, and five or six in height, and forming the cavity of the mouth, are attached to the under jaw, and rise from the jaw-bones, at an angle of about 80 degrees, having the appearance, when viewed in front, of the letter U. The upper jaw, including the crown bone or skull, is bent down at the extremity, so as to shut the front and upper parts of the cavity of the mouth, and is overlapped by the lips in a squamous manner at the sides.

When the mouth is open, it presents a cavity as large as a room, and capable of containing a merchant ship's jolly boat, full of men, being six or eight feet wide, ten or twelve feet high, (in front) and fifteen or sixteen feet long.

The fins, two in number, are placed between one third and two-fifths of the animal, from the snout, and about two feet behind the angle of the mouth;

they are from seven to nine feet in length, and four or five in breadth. The part by which they are attached to the body is somewhat elliptical, and about two feet in diameter; the side which strikes the water is nearly flat. The articulation being spherical, the fins are capable of motion in any direction; but, from the tension of the flesh and skin below, they can not be raised above the horizontal position. Hence, the account given by some naturalists, that the whale supports its young by its fin on its back, must be erroneous. The fins after death are always hard and stiff; but in the living animal, it is presumed, from the nature of the internal structure, that they are capable of considerable flexion. The whale has no dorsal fin. The tail, comprising in a single surface 80 or 100 square feet, is a formidable instrument of motion and defence. Its length is only five or six feet; but its width is from 18 to 24 or 26 feet. Its position is horizontal. In its form it is flat and semilunar; indented in the middle; the two lobes somewhat pointed, and turned a little backward. Its motions are rapid and universal; its strength immense.

The eyes are situated in the sides of the head, about a foot, obliquely, above and behind the angle of the mouth. They are remarkably small, in proportion to the bulk of the animal's body, being little larger than those of an ox. The whale has no external ear; nor can any orifice for the admission of sound be discovered until the skin is removed.

On the most elevated part of the head, about sixteen feet from the anterior extremity of the jaw, are situated two blow-holes, or spiracles, consisting of two longitudinal apertures, six or eight inches in length. These are the proper nostrils of the whale; a moist vapour, mixed with mucous, is discharged from them when the animal breathes; but no water accompanies it, unless an expiration of the breath be made under the surface.

The mouth, in place of teeth, contains two extensive rows of fins or whalebone, which are suspended from the sides of the crown bone. These series of fins are generally curved longitudinally, although they are sometimes straight, and give an arched form to the roof of the mouth. They are covered immediately by the lips attached to the lower jaw, and enclose the tongue between their lower extremities, each series, or "side of bone," as the whale fishers term it, consists of upward of 300 laminæ;* the longest are near the middle, from whence they gradually diminish away to nothing, at each extremity; fifteen feet is the greatest length of the whalebone; but ten or eleven feet is the average size, and thirteen feet is a magnitude seldom met with. The greatest breadth, which is at the gum, is ten or twelve inches. The laminæ, composing the two series of bone, are ranged side by side two-thirds of an inch apart, (thickness of the

* In a very small whale the number was 316 or 320.

blade included,) and resemble a frame of saws in a saw-mill, the interior edges are covered with a fringe of hair, and the exterior edges of every blade, excepting a few at each extremity of the series, is curved and flattened down, so as to present a smooth surface to the lips. In some whales a curious hollow on one side, and ridge on the other, occurs in many of the central blades of whalebone, at regular intervals of six or seven inches. May not this irregularity, like the rings in the horn of the ox, which they resemble, afford an intimation of the age of the whale? if so, twice the number of running feet in the longest lamina of whalebone, in the head of a whale not full grown, would represent its age in years. In the youngest whales, called suckers, the whalebone is only a few inches long; when the length reaches six feet or upwards, the whale is said to be *size*. The colour of the whalebone is brownish black, or bluish black. In some animals it is striped longitudinally with white. When newly cleaned, the surface exhibits a fine play of colour. A large whale sometimes affords a ton and a half of whalebone. If the "sample blade," that is, the largest lamina in the series, weigh seven pounds, the whole produce may be estimated at a ton; and so on in proportion. The whalebone is inserted into the crown bone, in a sort of rabbit. All the blades in the same series are connected together by the gum, in which the thick ends are inserted. This substance (the gums) is white, fibrous, tender, and

tasteless; it cuts like cheese. It has the appearance of the interior or kernel of the cocoa nut. The tongue occupies a large portion of the cavity of the mouth: and the arch formed by the whalebone, is capable of protrusion, being fixed from root to lip, to the fat extending between the jaw bones.

A slight beard, consisting of a few short scattered white hairs, surmounts the anterior extremity of both jaws.

The throat is remarkably straight.

Two paps in the female, afford the means of rearing the young. They are situated on the abdomen, one on each side of the pudendum, and are two feet apart. They appear not to be capable of protrusion, beyond the length of a few inches. In the dead animal they are always found retracted.

The milk of a whale, resembles that of a quadruped, in its appearance. It is said to be rich and well flavoured. The vent is about six inches behind the pudendum of the female; but in the male, it is further back.

The colour of the mysticetus is velvet black, gray, (composed of dots of blackish brown on a white ground,) and white with a tinge of yellow. The back, most of the upper jaw, and part of the lower jaw, together with the fins and tail, are black. The tongue, the lower part of the under jaw and lips, sometimes a little of the upper jaw, at the extremity, and a portion of the belly are white; and the eye-lids, the junction of the tail with the body,

a portion in the axillæ of the fins, &c. are gray. I have seen whales, that were all over piebald. The older animals contain the most gray and white; under size whales, are altogether of a bluish black, and suckers of pale bluish or bluish gray colour.

The skin of the body is slightly furrowed, like the water-lines on coarse laid paper. On the tail-fins, &c. it is smooth. The cuticle, or that part of the skin which can be pulled off in sheets, after it has been a little dried in the air, or particularly in frost, is not thicker than parchment? The rete mucosum in adults, is about three fourths of an inch in thickness over most parts of the body; in suckers nearly two inches; but on the under side of the fins, on the inside of the lips, and on the surface of the tongue, it is much thinner. This part of the integuments is generally of the same colour throughout its thickness. The fibres, of which it is composed, are perpendicular to the surface of the body: under this lies the true skin, which is white and tough. As it imperceptibly becomes impregnated with oil, and passes gradually into the form of blubber, its real thickness can not easily be stated. The most compact part, perhaps, may be a quarter of an inch thick.

Immediately beneath the skin, lies the blubber or fat, encompassing the whole body of the animal, together with the fins and tail. Its colour is yellowish white, yellow or red. In the very young animals, it is always yellowish white. In some old

animals it resembles in colour the substance of the salmon. It swims in water. Its thickness all round the body, is eight or ten or twenty inches, varying in different parts as well as in different individuals. The lips are composed almost entirely of blubber, and yield from one to two tons of pure oil each. The tongue is chiefly composed of a soft kind of fat, that affords less oil than any other blubber; in the centre of the tongue, and towards the root, the fat is intermixed with fibres of a muscular substance. The under jaw, excepting the two jaw bones, consists almost wholly of fat, and the crown bone possesses a considerable coating of it; the fins are principally blubber, tendons and bones, and the tail possesses a thin stratum of blubber. The oil appears to be retained in the blubber in minute cells, connected together by a strong reticulated combination of tendinous fibres. These fibres being condensed at the surface, appear to form the substance of the skin. The oil is expelled when heated, and in a great measure discharges itself out of the *henks*, whenever putrefaction in the fibrous parts of the blubber takes place. The blubber and the whalebone are the parts of the whale, to which the attention of the fisher is directed. The flesh and bones, excepting occasionally the jaw bone, are rejected. The blubber, in its fresh state, is without any unpleasant smell, and it is not until after the termination of the voyage, when the cargo is unstowed, that a Greenland ship becomes disagreeable.

Four tons of blubber, by measure, generally affords three tons of oil,* but the blubber of a sucker contains a very small portion. Whales have been caught that afforded nearly thirty tons of pure oil, and whales yielding twenty tons of oil, are by no means numerous. The quantity of oil, yielded by a whale, generally bears a certain proportion to the length of its longest blade of whalebone.

The average quantity is expressed in the following table.†

Length of whalebone in feet.	1	2	3	4	5	6	7	8	9	10	11	12
Oil yielded in tons.	1½	2¼	2¾	3¼	4	5	6½	8¼	11	13¾	17	21

Though this statement, on the average, be exceedingly near the truth, yet exceptions sometimes occur. A whale of 2½ feet bone, for instance, has been known to produce near ten tons of oil, and another of twelve feet bone only nine tons. Such instances, however, are very uncommon.

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* The ton or tun of oil, is 252 gallons, wine measure; it weighs, at temperature 60°, 1935lb. 12oz. 14dr. avoirdupois.

† This table is somewhat different from that given in Wernerian Memoirs, (Vol. I. p. 582,) an increased number of observations having enabled me to improve it.

A stout whale of sixty feet in length, is of the enormous weight of seventy tons; the blubber weighs about thirty tons, the bones of the head, whalebone, fins, and tail, eight or ten; carcass thirty or thirty-two.

The flesh of the young whale is of a red colour; and when cleared of fat, broiled and seasoned with pepper and salt, does not eat unlike coarse beef; that of the old whale, approaches to black, and is exceedingly coarse. An immense bed of muscles, surrounding the body, is appropriated chiefly to the movements of the tail. The tail consists principally of two reticulated beds of sinewy fibres, compactly interwoven, and containing very little oil. In the central bed, the fibres run in all directions; in the other, which encompasses the central one in a thinner stratum, they are arranged in regular order. These substances are extensively used, particularly in Holland, in the manufacture of glue.

Most of the bones of the whale are very porous, and contain large quantities of fine oil. The jaw bones, which measure twenty to twenty-five feet in length, are often taken care of, principally on account of the oil that drains out of them, when they come into a warm climate. When exhausted of oil, they readily swim in water. The external surface of the most porous bones is compact and hard; the ribs are pretty nearly solid; but the crown bone is almost as much honey-combed as the jaw bones. The number of ribs, according to Sir Charles Giesecke, is thirteen on each side. The

bones of the fins are analogous, both in proportion and number to those of the fingers of the human hand. From this peculiarity of structure, the fins have been denominated by Dr. Fleming, "swimming paws." The posterior extremity of the whale, however, is a real tail; the termination of the spine, or os coccygis, running through the middle of it, almost to the edge.

As the whale is flensed while afloat, with nearly the whole of the carcass under water, few opportunities of examining its anatomical structure occur. The smallest animals of the species, mere cubs or "suckers," may indeed be hoisted on deck; and it is in such cases only that I have had a chance of inspecting them entirely out of the water. One of these having been taken, the head was hoisted aboard in a mass, and the body, when stripped of the fat, was so small as to be quite within the power of the tackles. Some new facts, respecting the anatomy of the whale, arose out of the investigation of this, and another of the species, killed in the summer of 1821, which I shall attempt to describe. The following measurements and weight, it must be observed, all refer to a sucking whale, that at the time of capture, was under maternal protection, but the other details in general may be considered as applying to the whole species of the Balæna Mysticetus.

This whale, though a "sucker," was nineteen feet in length, and fourteen feet five inches in circumference, at the thickest part of the body. The

external skin, consisting of cuticle and rete mucosum, was on the body an inch and three quarters thick, being about twice the thickness of the same membranes in a full grown animal. The blubber, on an average, was five inches in thickness. The largest of the whalebone measured only twelve inches; about one half of which was imbedded in the gum. The external part of these fringes, not exceeding six inches in length, did not seem sufficient to enable the little whale yet to catch, by filtration out of the sea, the shrimps and other insects on which the animal, in a more advanced stage, is dependent for its nourishment: maternal assistance and protection, therefore, appeared to have been essential for its support. The muscles about the neck, appropriated to the movements of the jaws, formed a bed, if extended, of nearly five feet broad, and a foot thick. The central part of the diaphragm was two inches in thickness. The two principal arteries in the neck (the carotid,) were so large as to admit a man's hand and arm.

The brain lies in a small cavity in the upper and back part of the skull. The cavity included within the *pia mater*, exclusive of the foramen magnum, measured only eight inches by five. The upper part of the brain lies very near the surface of the skull. The convolutions of the cortical substance lie in beautiful fringed folds, attached to the medullary portion, which is white, as in the human brain. The general appearance of the brain is not unlike that of the other mammalia, but its smallness is remarka-

ble. The quantity of brain in a human subject of 140 or 160 pounds weight, is, according to Haller, 4 pounds; in this whale, of 11,200 pounds, or seventy times the weight of a man, the brain was only 3 pounds 12 ounces. According to Cuvier, the brain in man varies from one thirty-first to one twenty-second part of his weight;* whereas, in this animal, the proportion of brain was only a three thousandth part.

The heart, which is of an oblong form, much compressed, resembles in colour and substance, the heart of an ox. The breadth of it, in this specimen, was 29 inches, the height 12, the thickness 9, and the weight of it 64lbs. Diameter of the aorta about 6 inches.

Large as the whale is in bulk, the throat is but narrow. In this animal the djameter of the œsophagus, when fully distended, was scarcely 2½ inches, with difficulty admitting my hand.

The epiglottis is a beautiful valve, formed almost like the termination of the proboscis of an elephant. Though the larynx in the whale has a free communication with the mouth, as in quadrupeds, yet the mysticetus does not appear to have any voice. In

* Leçons d'Anat. Comp. ii. p. 149. The proportion the human brain bears to the weight of the body, appears to be, on an average, less than is stated by Cuvier. According to Haller, the proportion in a man of 160lb. weight is one-fortieth; in a man of 140lbs., one-thirty-fifth, in a child six years old, one-twenty-second.

other cetacea, however, this is not always the case; some of the dolphins, in particular, having been heard to emit a shrill sound, which in the beluga may be heard before the animal arises to the surface of the water.*

The external blowholes or spiracles, were, in the sucking whale, four inches in length; in the full grown animal, they form two curved slits, above ten inches long. In passing downward through the blubber, the blowholes, which at the surface are nearly longitudinal, as in the annexed figure, *a*, *a*,

twist into a semicircular and transverse position, in the form of the dotted line b, b, then penetrating the skull, they proceed backward and downward in two conical parallel canals, until they open near the back of the under part of the skull, where they inosculate and form a single membranous sac, within a few inches of the epiglottis. The first impression of each blowhole on the upper part of the skull, is marked as in the following cut, (representing the upper surface of the anterior part of the whale's skull, the skin and fat being removed,) by an oblong cavity, *b*, *b*,

* Captain Parry's Voyage for the discovery of a North West passage, p. 35.

which is the seat of a muscular substance attached by its anterior extremity to the surface of the skull, and also attached, by its posterior and inferior extremity, to the interior of the skull, at some depth in the blowing canal, *a*, *a*. The part of this muscle that penetrates the bony canal, is of a conical form, the apex downward, or within, represented at *b*, in the annexed figure of a vertical section of the skull;

Anterior portion.

so that, when this interior portion contracts, the muscular cone *b*, is drawn tight into the orifice, and completely closes the breathing canal *a*, *a*; while, on the other hand, the action of the external part of the muscle draws the conical plug forward and upward, and affords a free passage for the air in respiration. This beautiful structure it is, (aided, perhaps, by the epiglottis,) that enables the animal,

under the immense pressure to which it is sometimes exposed, to exclude the sea-water from its lungs. This pressure, under some depths to which the whale is known to descend, is upwards of a ton upon every square inch; yet, so far from the water being forced down the spiracles, the enormous load serves only more effectually to press down, and close the valves that defend the passages to the lungs.

The whale has no external ear, and the opening of the passage to this organ is so small as not to be easily discovered. In the sucking whale, it was only one-sixth of an inch in diameter. An elegant contrivance appears in the meatus auditorius externus for protecting the ear against pressure from without. It consists of a little plug, like the end of the finger, inserted into a corresponding cavity, in the midst of the canal, by a slight motion of which the opening can either be effectually shut for the exclusion of the sea-water, or opened for the admission of sound.

In the sucking whale, the skull or crown bone was six feet in length, from the anterior extremity to the condyles. In a full grown animal, in which the whalebone was ten feet four inches, the length of the skull, measured along the upper and convex side of the curve, was twenty feet eight inches, the cavity on the crown of the same, occupied by the muscular valve of the blow-holes, was 14 inches wide, and 24 inches long.

The whale being very nearly of the same specific gravity as sea-water, (some few individuals sinking, and others barely floating when dead) the weight may be calculated with considerable precision. The body of the whale may be divided into three segments, forming tolerably regular geometric solids. First; the *head* a parabolic conoid, which in the sucking-whale is four feet in diameter, and five and a half feet in height; its solid contents about thirty-four and a half cubic feet. Secondly; the middle segment, extending from the head to the thickest part of the body: this is a frustum of a cone in the sucking-whale, three feet in length, and four to five feet in diameter, producing a solid content of forty-eight cubic feet. Thirdly; the posterior segment, extending from the greatest circumference to the tail: this segment is a paraboloid or parabolic conoid, with its smaller end truncated. Its length in the sucking-whale is eight feet; its diameters one and five feet; and its solid contents eighty-one and a half cubic feet. And to these products may be added about ten cubic feet, the estimated bulk of the fins and tail, which make an amount of 174 cubic feet; this sum, divided by 35, the number of cubic feet of sea-water in the Greenland ocean, in a ton weight, gives the weight of the animal five tons within a cubic foot.

One of the largest mysticete, of sixty feet in length, the head twenty feet in length, by twelve feet in diameter, the middle section six feet by thir-

teen diameter, the third section twenty-six feet in length, by twelve and two feet diameter, will appear (if calculated the same way with an allowance of five tons for the fins and tail) to be of the prodigious weight of 114 tons! But as the last section is somewhat more slender than the body to which it is referred, this calculation may be a little in excess.

The largest animals of this species may, however, I conceive, be safely stated at a hundred tons in weight; and an ordinary full grown animal at seventy tons.

The most useful and ennobling view of natural history is, unquestionably, that which gives us the most exalted conceptions of the wisdom, power, and goodness of the Creator. And the branch of this science, that is in the highest degree calculated to assist us in tracing "the works of Nature up to Nature's God," is probably the physiology of animals. In every genus of animals we discover peculiar marks of adaptation for their economy or mode of life, and an endless variety of inimitable contrivances for accomplishing this adaptation.

The whale, which is a mammiferous animal, and closely allied, in its anatomical structure to the class of quadrupeds, affords, in the modification of the parts and principles of land animals, for applying them to a tribe inhabiting the sea, a great number of those striking displays of wisdom and power, the very contemplation of which is calculated to

elevate in no inconsiderable degree, our conceptions of the Great Supreme. The mysticetus feeds on the smallest insects; its capacious mouth, with the vast fringes of whalebone, which is a most admirable filter, enables it to receive some tons of water at a mouthful, and to separate every substance from it, of the size of a pin's head and upwards. The physalis feeds on herrings, mackarel and other fishes of a similar kind; its whalebone therefore is shorter, stronger, and less compact than that of the mysticetus, and the filter formed by it less perfect.

As the whale must rise to the surface of the sea to breathe, its tail is placed horizontally, to enable it to ascend and descend more quickly; and its nostrils, or blowholes, instead of being placed at the snout, are generally on the most elevated part of the head, that they may be readily lifted clear of the water.

When the whale descends to the depths of the ocean, it becomes exposed to an enormous pressure from the superincumbent water. This pressure is sufficient to force the water through the pores of the hardest wood; yet it is effectually resisted by the skin of the whale, though it is remarkably soft and flexible. To exclude the water from the lungs, which would occasion suffocation if admitted, the blowholes are defended by the peculiar valves that have been already described.

The variety discovered in the structure of whales, is by no means one of the least interesting parts of

their physiology. In other classes of animals, whose habits are similar, we often find, that each organ is the same as the corresponding one, in almost all the species of the same genus, or even of the same order; excepting when their peculiar habits, or necessities, require a modification of the general structure or principle. But in whales, as if it were intended not only to exhibit the matchless wisdom of the Creator, but, to show that his resources are unlimited, the structure of the breathing canals is varied in the different genera of cetaceous animals, and a number of contrivances alike extraordinary, equally beautiful, and equally efficient, are adapted for performing the same office.

TABLE *of the comparative dimensions of six Mysticete, from my own measurements.*

	Ft.	in.	Ft.	in.	Ft.	in.	Ft.	in.	Ft.	in.	Ft.	in.
Longest blade of whalebone,	1	0	6	6	10	10	11	2	11	6	13	7
Extreme length,	17	0	28	0	51	0	50	0	58	0	52	0
Length of the head,	5	0	8	6	16	0	15	6	19	0	20	0
Breadth of under jaw,							9	6	12	0		
Length from tip of lip to fin,	5	6	10	0			18	0				
——— to greatest circumference,	7	0					24	0				
Circumference at the neck,	10	0	18	6			31	6			34	0
Greatest circumference,	12	0	20	0			34	0	35	0		
Circumference by the genitalia,	9	0	15	6			19	0				
——— near the tail,	2	11	4	0	6	6	6	8				
Fin length,	2	3			7	0	6	4	8	6	9	0
— breadth,	1	3			4	0	4	0	5	0		
Tail length,					5	6	5	6	6	0	6	0
—— breadth,					20	0	17	6	24	0	20	10
Lip length,	4	9	8	2	15	6	15	0	18	6	19	6
— breadth,											6	2
Produce in oil (tons)	1		4		16		16		19		24	
Sex,	F.		M.				F.				M.	

The whale seems dull of hearing. A noise in the air, such as that produced by a person shouting, is not noticed by it, though at the distance only of a ship's length; but a very slight splashing in the water in calm weather excites its attention, and alarms it.

Its sense of seeing is acute, whales are observed to discover one another in clear water, when under the surface, at an amazing distance. When at the surface, however, they do not see far.

They have no voice; but in breathing or blowing, they make a very loud noise. The vapour they discharge is ejected to the height of some yards, and appears at a distance, like a puff of smoke. When the animals are wounded, it is often stained with blood; and, on the approach of death, jets of blood are sometimes discharged alone. They blow strongest, densest, and loudest, when "running." When in a state of alarm, or when they first appear at the surface, after being a long time down, they respire or blow about four or five times a minute.

The whale being somewhat lighter than the medium in which it swims, can remain at the surface of the sea, with its "crown," in which the blow-holes are situated, and a considerable extent of the back, above water, without any effort or motion. To descend, however, requires an exertion. The proportion of the whale that appears above water, when alive, or when recently killed, is probably not a twentieth part of the animal; but within a day after death, when the process of putrefaction commences, the whale swells to an enormous size, until at least a third of the carcass appears above water, and sometimes the body is burst by the force of air generated within.

By means of the tail principally, the whale advances through the water. The greatest velocity is produced by powerful strokes against the water, impressed alternately upward and downward; but a slower motion, it is believed, is elegantly produced, by cutting the water laterally and obliquely downward, in a manner similar to that in which a boat is forced along, with a single oar, by the operation of skulling. The fins are generally stretched out in an horizontal position; their chief application seems to be, the balancing of the animal, as the moment life is extinct, it always falls over on its side, or turns upon its back. They appear also to be used in bearing off their young, in turning, and giving a direction to the velocity produced by the tail.

Bulky as the whale is, and inactive, or indeed clumsy as it appears to be, one might imagine that all its motions would be sluggish, and its greatest exertions productive of but little celerity. The fact, however, is the reverse. A whale extended motionless at the surface of the sea, can sink in the space of five or six seconds or less, beyond the reach of its human enemies. Its velocity along the surface, or perpendicularly, or obliquely downward, is the same. I have observed a whale descending after I had harpooned it, to the depth of 400 fathoms, with the average velocity of seven or eight miles per hour. The usual rate at which whales swim, however, even when they are on their passage from one situation to another, seldom

exceeds four miles an hour: and though, when urged by the sight of any enemy, or alarmed by the stroke of a harpoon, their extreme velocity may be at the rate of eight or nine miles an hour; yet we find this speed never continues longer than for a few minutes, before it relaxes to almost one half; hence, for the space of a few minutes, they are capable of darting through the water, with the velocity almost of the fastest ship under sail, and of ascending with such rapidity as to leap entirely out of the water. This feat they sometimes perform as an amusement apparently, to the high admiration of the distant spectators; but to the no small terror of the inexperienced fishers, who even under such circumstances, are often ordered, by the fool-hardy harpooner, to "pull away," to the attack. Sometimes, the whales throw themselves into a perpendicular posture, with their heads downwards, and rearing their tails on high in the air, beat the water with awful violence. In both these cases, the sea is thrown into foam, and the air filled with vapours: the noise in calm weather is heard to a great distance; and the concentric waves, produced by the concussions on the water, are communicated abroad to a considerable extent. Sometimes the whale shakes its tremendous tail in the air, which, cracking like a whip, resounds to the distance of two or three miles.

When it retires from the surface, it first lifts its head, then plunging it under water, elevates its

back, like the segment of a sphere, deliberately rounds it away towards the extremity, throws its tail out of the water, and then disappears.

In their usual conduct, whales remain at the surface to breathe, about two minutes, seldom longer; during which time, they "blow" eight or nine times, and then descend for an interval usually of five or ten minutes, but sometimes, when feeding, fifteen or twenty. The depth to which they commonly descend, is not known, though, from the eddy occasionally observed on the water, it is evidently at times, only trifling. But when struck, the quantity of line they sometimes take out of the boats, in a perpendicular descent, affords a good measure of the depth. By this rule, they have been known to descend to the depth of an English mile, and with such velocity, that instances have occurred, in which whales have been drawn up by the line attached, from a depth of 700 or 800 fathoms, and have been found to have broken their jaw-bones, and sometimes crown-bone, by the blow struck against the bottom. Some persons are of opinion, that whales can remain under a field of ice, or at the bottom of the sea in shallow water, when undisturbed, for many hours at a time. Whales are seldom found sleeping, yet, in calm weather, among ice, instances occasionally occur.

The food of the whale consists of various species of actiniæ, cliones, sepiæ, medusæ, caneri, and

helices, or, at least, some of these genera are always to be seen, wherever any tribe of whales is found stationary and feeding. In the dead animals, however, in the very few instances, in which I have been enabled to open their stomachs, squillæ or shrimps, were the only substances discovered. In the mouth of a whale just killed, I once found a quantity of the same kind of insect.

When the whale feeds, it swims with considerable velocity below the surface of the sea, with its jaws widely extended. A stream of water consequently enters its capacious mouth, and along with it large quantities of water insects; the water escapes again at the sides; but the food is entangled and sifted, as it were, by the whalebone, which, from its compact arrangement, and the thick internal covering of hair, does not allow a particle the size of the smallest grain to escape.

There does not seem to be sufficient dissimilarity in the form and appearance of the mysticete found in the polar seas, to entitle them to a division into other species; yet such is the difference observed in the proportions of these animals, that they may be well considered as sub-species or varieties. In some of the mysticete, the head measures four tenths of the whole length of the animal; in others, scarcely three tenths; in some the circumference is upwards of seven tenths of the length, in others less than six tenths, or little more than one half.

The sexual intercourse of whales, is often observed about the latter end of summer; and females, with cubs or suckers along with them, being most commonly met with in the spring of the year, the time of their bringing forth, it is presumed, is in February or March; and their period of gestation about nine or ten months. In the latter end of April, 1811, a sucker was taken by a Hull whaler, to which the funis umbilicalis was still attached. The whale has one young at a birth. Instances of two being seen with a female are very rare. The young one, at the time of parturition, is said to be at least ten, if not fourteen feet in length. It goes under the protection of its mother for probably a year, or more; or until, by the evolution of the whalebone, it is enabled to procure its own nourishment. Supposing the criterion before mentioned, of the notches in the whalebone being indicative of the number of years growth, to be correct, then it would appear that the whale reaches the magnitude called *size*, that is, with a six feet length of whalebone, in twelve years, and attains its full growth at the age of twenty or twenty-five. Whales, doubtless, live to a great age. The marks of age are, increase in the quantity of gray colour in the skin, and a change to a yellowish tinge of the white parts about the head; a decrease in the quantity of oil yielded by a certain weight of blubber; an increase of hardness in the blubber, and in the thickness and strength

of the ligamentous fibres of which it is partly composed.

The maternal affection of the whale, which, in other respects, is apparently a stupid animal, is striking and interesting, the cub, being insensible to danger, is easily harpooned; when the tender attachment of the mother is so manifested as not unfrequently to bring her within the reach of the whalers. Hence, though a cub is of little value, seldom producing above a ton of oil, and often less, yet it is sometimes struck as a snare for its mother. In this case she joins it at the surface of the water, whenever it has occasion to rise for respiration; encourages it to swim off; assists its flight, by taking it under her fin, and seldom deserts it while life remains. She is then dangerous to approach; but affords frequent opportunities for attack. She loses all regard for her own safety, in anxiety for the preservation of her young; dashes through the midst of her enemies; despises the danger that threatens her; and even voluntarily remains with her offspring, after various attacks on herself, from the harpoons of the fishers. In June, 1811, one of my harpooners struck a sucker, with the hope of its leading to the capture of the mother. Presently she arose close by the "fast boat," and seizing the young one, dragged about a hundred fathoms of line with remarkable force and velocity. Again she arose to the surface; darted furiously to and fro; frequently

stopped short, or suddenly changed her direction, and gave every possible intimation of extreme agony. For a length of time she continued thus to act, though closely pursued by the boats; and, inspired with courage and resolution by the concern for her offspring, seemed regardless of the danger which surrounded her. At length one of the boats approached so near that a harpoon was hove at her. It hit, but did not attach itself. A second harpoon was struck; this also failed to penetrate; but a third was more effectual, and held. Still she did not attempt to escape; but allowed other boats to approach; so that, in a few minutes, three more harpoons were fastened; and, in the course of an hour afterwards, she was killed.

There is something extremely painful in the destruction of a whale, when thus evincing a degree of affectionate regard for its offspring, that would do honour to the superior intelligence of human beings; yet the object of the adventure, the value of the prize, the joy of the capture, can not be sacrificed to feelings of compassion. Whales, though often found in great numbers together, can scarcely be said to be gregarious; found most generally solitary, or in pairs, excepting when drawn to the same spot, by the attraction of an abundance of palatable food, or a choice situation of the ice.

The superiority of the sexes, in point of numbers, seems to be in favour of the male. Of 121 whales which have been taken near Spitzbergen, in eight

years, in ships commanded by myself, 70 were males, and 54 were females, being in the proportion of five to four nearly. The mysticetus occurs most abundantly in the frozen seas of Greenland and Davis's Strait —in the bays of Baffin and Hudson—in the sea to the northward of Behring's Strait, and along some parts of the northern shores of Asia, and probably America. It is never met with in the German Ocean, and rarely within 200 leagues of the British coast; but along the coasts of Africa and South America, it is met with periodically in considerable numbers. In these regions it is attacked and captured by the Southern British and American Whalers, as well as by some of the people inhabiting the coasts, to the neighbourhood of which it resorts. Whether this whale is precisely of the same kind as that of Spitzbergen and Greenland, is uncertain, though it is evidently a mysticetus. One striking difference, possibly the effect of situation and climate, is, that the mysticetus found in southern regions is often covered with barnacles, (Lepas diadema, &c.) while those of the Arctic seas are free from these shell-fish.

It would be remarkable, if an animal like the whale, which is so timid that a bird alighting upon its back sometimes sets it off in great agitation and terror, should be wholly devoid of enemies. Besides man, who is doubtless its most formidable adversary, it is subject to annoyance from sharks, and it is also said from the narwal, sword-fish, and

thresher. With regard to the narwal, I am persuaded that this opinion is incorrect, for so far from its being an enemy, it is found to associate with the whale in the greatest apparent harmony, and its appearance, indeed, in the Greenland sea is hailed by the fishers, the narwal being considered as the harbinger of the whale. But the sword-fish and thresher, (if such an animal there be) may possibly be among the enemies of the whale, notwithstanding I have never witnessed their combats; and the shark is known certainly to be an enemy, though perhaps not a very formidable one. Whales indeed flee the seas where it abounds, and evince by marks occasionally found on their tails, a strong evidence of their having been bit by the shark. A living whale may be annoyed, though it can scarcely be supposed to be ever overcome by the shark; but a dead whale is an easy prey, and affords a fine banquet to this insatiable creature.

The whale, from its vast bulk, and variety of products, is of great importance in commerce, as well as in the domestic economy of savage nations; and its oil and whalebone are of extensive application in the arts and manufactures. A description of its most valuable products, and of the uses to which they are applied, being included in the account of the whale fishery, which follows, it will only be necessary, in this place, to mention the purposes to which parts and products, not now objects of commerce, are or might be applied.

Though to the refined palate of a modern European, the flesh of a whale, as an article of food, would be received with abhorrence, yet we find that it is considered by some of the inhabitants of the northern shores of Europe, Asia, and America, as well as those on the coasts of Hudson's Bay, and Davis's strait, as a choice and staple article of subsistence. The Esquimaux eat the flesh and fat of the whale, and drink the oil with greediness. Indeed, some tribes, who are not familiarized with spiritous liquors, carry along with them in their canoes, in their fishing excursions, bladders filled with oil, which they use in the same way, and with a similar relish, that a British sailor does a dram.* They also eat the skin of the whale raw, both adults and children; for it is not uncommon, when the females visit the whale-ships, for them to help themselves to pieces of skin, preferring those with which a little blubber is connected, and to give it as food to their infants suspended on their backs, who suck it with apparent delight.

Blubber, when pickled and boiled, is said to be very palatable; the tail, when parboiled and then fried, is said to be not unsavoury, but even agreeable eating; and the flesh of young whales, I know, from experiment, is by no means indifferent food.

Not only is it certain that the flesh of the whale is now eaten by savage nations, but it is also well

* Ellis's voyage to Hudson's Bay, p. 233.

authenticated that, in the 12th, 13th, 14th, and 15th centuries, it was used as food by the Icelanders, the Netherlanders, the French, the Spanish, and probably by the English. M. S. B. Noel, in a tract on the whale fishery,* informs us, that about the 13th century, the flesh, particularly the tongue of whales, was sold in the markets of Bayonne, Ciboure and Beariz, where it was esteemed as a great delicacy, being used at the best tables; and even so late as the 15th century, he conceives, from the authority of Charles Etienne, that the principal nourishment of the poor in Lent, in some districts of France, consisted of the flesh and fat of the whale.

Besides forming a choice eatable, the inferior products of the whale are applied to other purposes by the Indian and Esquimaux of Arctic countries, and with some nations are essential to their comfort, some membranes of the abdomen are used for an upper article of clothing, and the peritoneum, in particular, being thin and transparent, is used instead of glass in the windows of their huts; the bones are converted into harpoons and spears, for striking the seal, or darting at the sea-birds, and are also employed in the erection of their tents, and with some tribes, in the formation of their boats; the sinews are divided into filaments, and used as thread, with which they join the seams of their

* Memoire sur "l'Antiquité de la Pêche de la Baleine par les nations Européennes."

coats and tent cloths, and sew with great taste and nicety the different articles of dress they manufacture; and the whalebone and other superior products, so valuable in European markets, have also their uses among them.

I shall conclude this account of the mysticetus, with a sketch of some of the characters which belong generally to cetaceous animals.

Whales are viviparous: they have but one young at a time, and suckle it with teats. They are furnished with lungs, and are under the necessity of approaching the surface of the water at intervals to respire in the air. The heart has two ventricles and two auricles. The blood is warmer than in the human species; in a narwal that had been an hour and a half dead, the temperature of the blood was 97°; and in a mysticetus recently killed 102°. All of them inhabit the sea. Some of them procure their food by means of a kind of sieve, composed of two fringes of whalebone: these have no teeth. Others have no whalebone, but are furnished with teeth. They all have two lateral or pectoral fins, with concealed bones like those of a hand; and a large flexible horizontal tail, which is the principal member of motion. Some have a kind of dorsal fin, which is an adipose or cartilaginous substance, without motion. This fin, varying in form, size, and position, in different species, and being in a conspicuous situation, is well adapt-

ed for a specific distinction. The appearance and dimensions of the whalebone and teeth, especially the former, are other specific characteristics. All whales have spiracles or blowholes, some with one, others with two openings, through which they breathe; some have a smooth skin all over the body; others have rugæ or sulci about the region of the thorax and on the lower jaw. And all afford, beneath the integuments, a quantity of fat or blubber, from whence a useful and valuable oil, the train oil of commerce, is extracted.

Species II.—*The Razor-back.*

Balæna Physalis; L.

Balænoptera Gibbar: La Cepède.

This is the longest animal of the whale tribe; and probably, the most powerful and bulky of created beings. It differs from the mysticetus, in its form being less cylindrical, and its body longer and more slender; in its whalebone being shorter; its produce in blubber and oil being less; in its colour being of a bluer tinge; in its fins being more in number, in its breathing or blowing being more violent; in its speed being greater; in its actions being quicker and more restless, and in its conduct being bolder.

The length of the physalis is about 100 feet; its greatest circumference 30 or 35. The body is not cylindrical, but is considerably compressed on the side, and angular at the back. A transverse section near the fins is an oblong, and at the rump a rhombus. The longest lamina of whalebone measures about four feet; it affords ten or twelve tons of blubber. Its colour is a pale bluish black, or dark bluish gray, in which it resembles the sucking mysticetus. Besides the two pectoral fins, it has a small horny protuberance, or rayless and immoveable fin, on the extremity of the back. Its blowing is very violent, and may be heard in calm weather, at the distance of about a mile. It swims with a velocity at the greatest of about twelve miles an hour. It is by no means a timid animal, yet it does not appear to be revengeful or mischievous. When closely pursued by boats, it manifests little fear, and does not attempt to outstrip them in the race; but merely endeavours to avoid them by diving or changing its direction. If harpooned, or otherwise wounded, it then exerts all its energies, and escapes with its utmost velocity, but shows little disposition to retaliate on its enemies, or to repel their attacks by engaging in a combat. Though at a distance the physalis is sometimes mistaken by the whalers for the mysticetus; yet its appearance and actions are so different, that it may be generally distinguished. It seldom lies quietly on the surface of the water when blowing, but usually has a velocity of four or five miles

an hour; and when it descends, it very rarely throws its tail in the air, which is a very general practice with the mysticetus.

The great speed and activity of the physalis, render it a difficult and dangerous object of attack; while the small quantity of inferior oil it affords, makes it unworthy the general attention of the fishers. When struck, it frequently drags the fast boat with such speed through the water, that it is liable to be carried immediately beyond the reach of assistance, and soon out of sight of both boats and ship. Hence the striker is under the necessity of cutting the line, and sacrificing his employer's property, for securing the safety of himself and companions. I have made different attempts to capture one of these formidable creatures. In the year 1818, I ordered a general chase of them, providing against the danger of having my crew separated from the ship, by appointing a rendezvous on the shore, not far distant, and preparing against the loss of much line, by dividing it at 200 fathoms from the harpoon, and affixing a buoy to the end of it. Thus arranged, one of these whales was shot, and another struck. The former dived with such impetuosity, that the line was broken by the resistance of the buoy, as soon as it was thrown into the water, and the latter was liberated within a minute by the the division of the line, occasioned, it was supposed, by its friction against the dorsal fin. Both of them escaped. Another physalis was struck by one of

my inexperienced harpooners, who mistook it for a mysticetus. It dived obliquely with such velocity, that 480 fathoms of line were withdrawn from the boat in about a minute of time. This whale was also lost by the breaking of the line.

The following observations on this animal have been derived from different persons who have had opportunities of examining it when dead.

Length of a physalis found dead in Davis's Strait 105 feet, greatest circumference about 38. Head small, compared with that of the common whale; fins long and narrow; tail about twelve feet broad, finely formed; whalebone about four feet in length, thick, bristly and narrow; blubber six or eight inches thick, of indifferent quality; colour bluish black on the back, and bluish gray on the belly; skin smooth, excepting about the side of the thorax, where longitudinal rugæ or sulci occur. The physalis occurs in great numbers in the Arctic seas, especially along the edge of the ice, between Cherie Island and Nova Zembla, and also near Jan Mayen. Persons trading to Archangel have often mistaken it for the common whale. It is seldom seen among much ice, and seems to be avoided by the mysticetus; as such, the whale fishers view its appearance with painful concern. It inhabits most generally in the Spitzbergen quarter, the parallels of from 70 to 76 degrees, but in the months of June, July, and August, when the sea is usually open, it advances along the land to the northward as high

as the 80th degree of latitude. In open seasons it is seen near the headland at an earlier period. A whale, probably of this kind, 101 feet in length, was stranded on the banks of the Humber, about the middle of September, 1750.

Species III.—*The Broad-nosed Whale.*

Balæna Musculus; L.

Balænoptera Rorqual: La Cepède.

This species of whale frequents the coasts of Scotland, Ireland, and Norway, &c. and is said to feed principally upon herrings. Several characters of the musculus very much resemble those of the physalis, though I believe there is an essential difference between the two animals; the musculus being shorter, having a larger head and mouth, and rounder under jaw, than the physalis. Several individuals, apparently of this kind, have been stranded or killed on different parts of the coast of the United Kingdom. One, 52 feet in length, was stranded near Eyemouth, June 19th, 1752. Another, nearly 70 feet in length, ran ashore on the coast of Cornwall, on the 18th, of June, 1797. Three were killed on the northwest coast of Ireland, in the year 1762, and two in 1763; one or two have been killed in the Thames, and one was embayed and killed in

Baltic sound, Shetland, in the winter of 1817–18; some remains of which I saw. This latter whale, was 82 feet in length, the jaw bones were 31 feet long, the longest lamina of whalebone about three feet long. Instead of hair at the inner edge and at the front of each blade of whalebone, it had a fringe of bristly fibres; and it was stiffer, harder, and more horny in its texture than common whalebone. This whale produced only about five tons of oil, all of it of an inferior quality, some of it viscid and bad. It was valued altogether, expenses of removing the produce and extracting the oil deducted, at no more than 60*l.* Sterling. It had the usual sulci about the thorax, and a dorsal fin.

In its blowing, swimming, and general action, as well as in its appearance in the water, the musculus very much resembles the physalis, from which, indeed, while living, it can scarcely be distinguished.

Species IV.—*The Finner.*

Balæna Boops: L.

Balænoptera Jubartes; La Cepède.

Length about 46 feet; greatest circumference of the body about 20 feet; dorsal protuberance or fin, about two feet and a half high; pectoral fin, four or five feet long, externally, and scarcely a foot broad; tail

about three feet deep, and ten broad; whalebone about 300 laminæ on each side, the longest about 18 inches in length; the under jaw about 15 feet long, or one third of whole length of the animal; sulci about two dozen in number; two external blow-holes; blubber on the body, two or three inches thick; under the sulci none.

In the Memoirs of the Wernerian Society, a description of a whale, corresponding in its dimensions, at least, with the Balæna Boops, has been given to the public by Mr. P. Neill, Edinburgh.* This whale was stranded on the banks of the Forth, near Alloa, and had been considerably mutilated before Mr. Neill had an opportunity of examining it. It is considered by him, a Balæna Rostrata. From his valuable paper, part of the above description is taken, which differs so much from a Rostrata noticed below, particularly in its larger dimensions, and in the greater proportion which the head bears to the body, that it would appear to belong either to the Balæna Boops or to an undescribed species. From the inaccuracy of the sketches of almost all the whales hitherto figured, the naturalist is rather plagued than assisted by them. As such, the figures given by La Cepède and others, can scarcely be of any service, in determining the species of this whale.

* Vol. 1. p. 201.

Species V.—*The Beaked Whale.*

Balæna Rostrata; L.

Balænoptera Acuto Rostrata: La Cepéde.

This is the last and the smallest of the whalebone whales with which I am acquainted. An animal of this species was killed in Scalpa Bay, November 14, 1808. Its length was 17½ feet, circumference 20 feet, length from the snout to the dorsal fin 17½ feet, from the snout to the pectoral fin 5 feet, from the snout to the eye 3½ feet, and from the snout to the blowholes 3 feet. Pectoral fins two feet long and seven inches broad; dorsal fin 15 inches long by 9 inches high, tail 15 inches long by 4½ feet broad. Largest whalebone about six inches. Colour of the back black; of the belly glossy white; and of the grooves of the plicæ, according to Mrs. Traill, who saw it on the beach in Scalpa Bay, a sort of flesh colour.

The Rostrata is said to inhabit principally the Norwegian seas, and to grow to the length of 25 feet. One of the species was killed near Spitzbergen, in the year 1813, some of the whalebone of which I now have in my possession. It is thin, fibrous, of a yellowish white colour, and semi-transparent, almost like lantern horns. It is curved like a scymetar, and fringed with white hair on the convex edge and point. Its length is 9 inches; greatest breadth 2¼.

THE WHALE FISHERY.

Observations on the Fishery of different latitudes and seasons, and under different circumstances of Ice, Wind, and Weather.

It is not yet ascertained, what is the earliest period of the year, in which it is possible to fish for whales. The danger attending the navigation, amidst massive drift ice in the obscurity of night, is the most formidable objection against attempting the fishery before the middle of the month of April, when the sun, having entered the northern tropic, begins to enlighten the Polar regions throughout the twenty-four hours. Severity of frost, prevalence of storms, and frequency of thick weather, arising from snow and frost rime, are the usual concomitants of the spring of the year; and these, when combined with the darkness incident to night, a tempestuous sea, and crowded ice, must probably produce as high a degree of horror in the mind of the navigator, who is unhappily subjected to their distressful influence, as any combination of circumstances which the imagination can present. Some ships have sailed to the northward of the seventy-eighth degree of latitude, before the close of the month of March; but I am not acquainted with a single instance, where the hardy fishers have, at this

season, derived any compensation for the extraordinary dangers to which they were exposed. In the course of the month of April, on certain occasions, considerable progress has been made in the fishery, notwithstanding the frequency of storms. At the first stage of the business, in *open* seasons, the whales are usually found in most abundance on the borders of the ice, near Hackluyt's Headland, in the latitude of 80°. A degree or two farther south, they are sometimes seen, though not in much plenty; but in the 76th degree, they sometimes occur in such numbers, as to present a tolerable prospect of success in assailing them. Some rare instances have occurred, wherein they have been seen on the edge of the ice, extending from Cherry Island to Point-look-out, in the early part of the season.

In the year 1803, the fishery of April was considerable in the latitude of 80°; in 1813, many whales were seen in the same latitude; but the weather being tempestuous in an almost unprecedented degree, but few were killed: and in the intermediate years, the fishery was never general in this month, and but seldom begun at all before the commencement of May. In 1814, the fishery commenced before the middle of April, and some ships derived uncommon advantage from an early arrival. In 1815, some ships were near Spitzbergen in March, and fished in the first week of April in the latitude of 80°, where a great number of

whales were seen. Accompanying the ice in its drift, along the coast to the southward, the same *tribe* of whales were seen in the latitude of 78°, about the middle and end of the month; and a considerable number were killed. In 1816, fish were seen in 80°, in the same month, but few killed, on account of the formation of bay ice upon the sea. In 1817, the weather was very tempestuous in April, and scarcely any whales were killed; and in 1818, the fishery of this month was inconsiderable.

Grown fish are frequently found at the edge, or a little within the edge of the loose ice, in the 79th degree of north latitude, in the month of May; and small whales of different ages at fields, and sometimes in bays of the ice in the 80th degree.

Usually, the fish are most plentiful in June; and on some occasions they are met with in every degree of latitude from 75° to 80°. In this month, the large whales are found in every variety of situation; sometimes in open water, at others in the loose ice, or at the edges of fields and floes, near the main impervious body of ice, extending towards the coast of *West* Greenland. The smaller animals of the species are, at the same time, found farther to the south, than in the spring, at floes, fields, or even among loose ice, but most plentiful about fields or floes, at the border of the main western ice, in the latitude of 78 or 78½ degrees.

In July, the fishery generally terminates, sometimes at the beginning of the month, at others,

though more rarely, it continues throughout the greater part of it. Few small fish are seen at this season. The large whales, when plentiful, are found occasionally in every intermediate situation, between the open sea and the main ice, in one direction, and between the latitudes of 75° and 79° in the other, but rarely as far north as 80°.

The parallel of 78 to 78½ degrees, is, on the whole, the most productive fishing station. The interval between this parallel and 80°, or any other situation more remote, is called the "northward," and any situation in a lower latitude than 78°, is called the "southward."

Though the 79th degree affords whales in the greatest abundance, yet the 76th degree affords them, perhaps, more generally. In this latter situation, a very large kind of the mysticetus is commonly to be found throughout the season, from April to July inclusive. Their number, however, is not often great; and as the situation in which they occur is unsheltered, and, consequently, exposed to heavy swells, the southern fishery is not much frequented.

The parallel of 77° to 77½°, is considered a "dead latitude," by the fishers, but occasionally it affords whales also.

From an attentive observation of facts, it would appear, that different tribes of the mysticetus inhabit different regions, and pursue different routes on their removal from the places where first seen.

These tribes seem to be distinguished by a difference of age or manners, and in some instances, apparently by a difference of species, or sub-species. The whales seen in the spring in the latitude of 80°, which are usually full grown animals, disappear generally by the end of April; and the place of their retreat is unknown. Those inhabiting the regions of 78°, are of a mixed size. Such as resort to fields in May and the beginning of June, are generally young animals; and those seen in the latitude of 76°, are almost always of the very largest kind. Instances are remembered by some aged captains, wherein a number have been taken in the *southward* fishing stations, which were astonishingly productive of oil. It is probable, that the difference in the appearance of the heads, or the difference of proportion existing between the heads and bodies of some mysticete, are distinguishable of a difference in the species, or sub-species. Those inhabiting southern latitudes, have commonly long heads and bodies, compared with their circumference, moderately thick blubber and long whalebone; those of the mean fishing latitude, that is 78°—79°, have more commonly short broad heads, compared with the size of the body. In some individuals, the head is at least one-third of the whole length of the animal, but in others scarcely two-sevenths. Hence, it is exceedingly probable, that the whales seen early in April, in the latitude of 80°, are a peculiar tribe, which do not re-appear during the remainder

of the season; and that those inhabiting the latitude of 78° and of 76°, are likewise distinct tribes.

Notwithstanding, if we descend to particulars, the great variety and uncertainty which appear in the nature of the situations preferred by the whales, and the apparent dissimilarity observed in their habits, it is probable, that, were the different tribes distinguished, we should find a much greater degree of similarity in their choice of situation and in their general habits than we are at present able to trace.

Annoyed as the whales are by the fishers, it is not surprising that they sometimes vary their usual places of resort, and it is not improbable, were they left undisturbed for a few years, but that they might return to the bays and sea-coasts of Spitzbergen and its neighbouring islands, as was formerly the custom with certain tribes, at the commencement of this fishery. We are doubtless in a great measure indebted to the necessity they are under, of performing the function of respiration in the air, at stated intervals, for being able to meet with them at all; though the coast of Spitzbergen may possibly possess powerful attraction to the mysticete, by affording them a greater abundance of palatable food than the interior western waters, covered perpetually by the ice. From this necessity of respiring in the air, we may account for their appearance in the open sea in the early part of the spring. The ice at this season, connected by the winter's frost, is so consolidated, as to prevent the whales from breathing among it, excepting

within so much of its confines as may be broken by the violence of the sea in storms. After the dissolution of the continuity of the ice, by north, north-west, or west winds, they find sufficient convenience for respiration in the interior, and often retreat thither to the great disadvantage of the whalers. In such cases, if the formation of bay ice, or the continuity of the border of the heavy ice, prevents the ships from following, the whales completely escape their enemies, until the relaxation of the frost permits an entrance.

It is not uncommon, however, for an adult tribe of whales, to resort partially to the open sea, between the latitudes of 76° and 79°, during the months of May and June, and, though more rarely, during the early part of July, when, at length, they suddenly betake themselves to the ice, and disappear altogether.

The systematical movements of the whales receive additional illustration from many well known facts. Sometimes a large tribe, passing from one place to another, which, under such circumstances, is denominated a "run of fish," has been traced in its movements in a direct line from the south towards the north, along the seaward edge of the western ice, through a space of two or three degrees of latitude; then it has been ascertained to have entered the ice, and penetrated to the north-westward, beyond the reach of the fishers. In certain years, it is curious to observe, that the whales commence a

simultaneous retreat throughout the whole fishing limits, and all disappear within the space of a very few days. On such occasions it has often happened, that not a single whale has been seen by any individual belonging to the whole Greenland fleet, after perhaps the middle of June, but more commonly after the first or second week in July, notwithstanding many of the fleet may have cruised about in the fishing region for a month afterwards. In the year 1813, whales were found in considerable numbers in the open sea, during the greater part of the fishing season, but in the greatest abundance about the end of June and beginning of July. On the 6th of July, they departed into the ice, and were followed by the fishers; several were killed during the three succeeding days, but they wholly disappeared after the 9th. Notwithstanding, several ships cruised "the country," for some weeks afterwards, in all navigable directions, through an extent of four degrees of latitude, and penetrated the ice as far as the main western body, in different parallels, it does not appear that a single whale was caught, and as far as I was able to learn, but one was seen, and this individual was observed to be rapidly advancing towards the north-west. I do not mention this as an uncommon circumstance, because a similar case occurs frequently, but as a single illustration of the foregoing observation.

When the fishery for the season, in the opinion of the British whalers, has altogether ceased, it ap-

pears from the observation of the Dutch,* that it may frequently be recommenced in the autumn, at the verge of the most northern waters, near Hackluyt's Headland. They consider the fish which then appear as the same tribe that are seen in this place in the spring of the year, and enter the ice, immediately after it opens in the north. On the recommencement of the frost, they instinctively return to prevent themselves being enclosed so far within the ice, as to occasion suffocation from the freezing up of the openings through which they might otherwise breathe.

This tribe are supposed by the Dutch to be really inhabitants of the sea adjoining West Greenland; that they always retreat thither whenever the state of the ice will admit, and only appear within the observation of the fishers, when the solidity of the ice prevents their attaining those favourite situations, where they probably find the most agreeable food.†

The whales, of lower latitudes, however, whose food lies near the eastern margin of the main ice, when they enter the ice in May and June, seem to exhibit an intention of evading their pursuers; for in whatever manner they may retreat for a while, they frequently return to the same or other similar place.

* Beschryving der Walvisvangst, vol. 1, p. 52.

† Beschryving, &c. vol. 1, p. 52.—As I have never seen whales in this situation in the autumn myself, I give the information entirely on the authority of the work here quoted.

accessible to the fishers. But after the month of July, this tribe also penetrates so deeply into the ice, that it gets beyond the reach of its enemies.

Experience proves, that the whale has its favourite places of resort, depending on a sufficiency of food, particular circumstances of weather, and particular positions and qualities of the ice. Thus, though many whales may have been seen in open water, when the weather was fine, after the occurrence of a storm, perhaps not one is to be seen. And, though fields are sometimes the resort of hundreds of whales, yet, whenever the loose ice around separates entirely away, the whales quit them also. Hence fields seldom afford whales in much abundance, excepting at the time when they first "break out," and become accessible; that is, immediately after a vacancy is made on some side by the separation of adjoining fields, floes, or drift ice. Whales, on leaving fields which have become exposed, frequently retire to other more obscure situations in a west or northwest direction; but occasionally they retreat no farther than the neighbouring drift ice, from whence they sometimes return to the fields at regular intervals of six, twelve or twenty-four hours.

Whales are rarely seen in abundance in the large open space of water, which sometimes occurs amidst fields and floes, nor are they commonly seen in a very open pack, unless it be in the immediate neighbourhood of the main western ice. They seem to have a preference for close packs and patches of ice: and for fields under certain circumstances; for

deep bays or *bights*, and sometimes for clear water situations; occasionally for detached streams of drift ice; and most generally, for extensive sheets of bay ice. Bay ice is a very favourite retreat of the whales, so long as it continues sufficiently tender to be conveniently broken, for the purpose of respiration. In such situations, whales may frequently be seen in amazing numbers, elevating and breaking the ice with their *crowns*,* where they are observed to remain much longer at rest than when seen in open water, or in the clear interstices of the ice, or indeed in almost any other situation.

Description of the boats and principal instruments used in the capture of the whale.

Whale-boats are, of course, peculiarly adapted for the occupation they are intended to be employed in. A well constructed "Greenland boat," possesses the following properties. It floats lightly and safely on the water,—is capable of being rowed with great speed, and readily turned round,—it is of such capacity that it carries six or seven men, seven or eight hundred weight of whale-lines, and various other materials, and yet retains the necessary properties of safety, buoyancy, and speed, either in smooth water, or where it is exposed to a considerable sea. Whale-boats being very liable to receive damage, both from whales and ice, are al-

* The eminence on the head of the whale, in which the blow-holes are situated, is thus called.

ways *carver-built*,—a structure which is easily repaired. They are usually of the following dimensions. Those called "six oared boats," adapted for carrying seven men, six of whom, including the harpooner, are rowers, are generally 26 to 28 feet in length, and about five feet nine inches in breadth. Six men boats, that is, with five rowers and a steersman, are usually 25 to 26 feet in length, and about five feet six inches in breadth. And "four oared boats," are usually twenty-three to twenty-four in length, and about five feet three inches in breadth. The main breadth of the two first classes of boats is at about three-sevenths of the length of the boat reckoned from the stem; but, in the last class, it is necessary to have the main breadth within one-third of the length of the boat from the stem. The object of this is, to enable the smaller boat to support, without being dragged under water, as great a strain on the lines as those of a larger class; otherwise, if such a boat were sent out by itself, its lines would be always liable to be lost before any assistance could reach it. The five oared or six men boat, is that which is in most general use; though each fishing ship generally carries one or two of the largest class. These boats are now commonly built of fir-boards, one half or three-fourths of an inch thick, with timbers, keel, gunwales, stem and stern-post of oak. An improvement in the timbering of whale-boats has lately been made, by sawing the timber out of very straight grained oak, and bending them to the required form, after being made

supple, by the application of steam, or immersion in boiling water. This improvement, which renders the timbers more elastic, than when they are sawn out of crooked oak, at the same time makes the boat stronger and lighter. Though the principle has long been acted upon in clincher-built boats, with ash timbers, the application to carver-built whale-boats, is, I believe, new. The bow and stern of Greenland boats, are both sharp, and, in appearance, very similar; but the stern forms a more acute angle than the bow. The keel has some inches depression in the middle, from which the facility of turning is acquired.

The instruments of general use in the capture of the whale, are the harpoon and lance.

The harpoon (fig. 4.) is an instrument of iron, of about three feet in length. It consists of three conjoined parts, called the "socket," "shank," and "mouth," the latter of which includes the barbs or "withers." This instrument, if we except a small addition to the barbs, and some enlargement of dimensions, maintains the same form in which it was originally used in the fishery two centuries ago. At that time, the mouth or barbed extremity was of a triangular shape, united to the shank in the middle of one of the sides; and this being scooped out on each side of the shank, formed two simple flat barbs. In the course of last century, an improvement was made, by adding another small barb, resembling the beard of a fish-hook, within each of the former withers, in a reverse position. The two principal withers, in

the present improved harpoon, measure about eight inches in length and six in breadth; the shank is eighteen inches to two feet in length, and four-tenths of an inch in diameter, and the socket, which is hollow, swells from the size of the shank to near two inches diameter, and is about six inches in length. Now, when the harpoon is forced by a blow into the fat of the whale, and the line is held tight, the principal withers seize the strong ligamentous fibres of the blubber, and prevent it from being withdrawn; and in the event of its being pulled out, so far as to remain entangled by one wither only, which is frequently the case, then the little reverse barb, or "stop wither," as it is called, collecting a number of the same reticulated sinewy fibres, which are very numerous near the skin, prevents the harpoon from being shaken out by the ordinary motions of the whale. The point and exterior edges of the barbs of the harpoon, are sharpened to a rough edge, by means of a file. This part of the harpoon is not formed of steel, as it is frequently represented, but of common soft iron; so that when blunted, it can be readily sharpened by a file, or even by scraping it with a knife. The most important part in the construction of this instrument, is the shank. As this part is liable to be forcibly and sudddenly extended, twisted and bent, it requires to be made of the softest and most pliable iron. That kind which is of the most approved tenacity, is made of old horse-shoe nails or *stubs*, which are formed into small rods, and two or three

of these welded together; so that should a flaw happen to occur in any one of the rods, the strength of the whole might still be depended on. Some manufacturers enclose a quantity of stub-iron in a cylinder of best foreign iron, and form the shank of the harpoon out of a single rod. A test sometimes used for trying the sufficiency of a harpoon, is to wind its shank round a bolt of inch iron, in the form of a close spiral, then to unwind it again, and put it into a straight form. If it bears this without injury in the *cold* state, it is considered as excellent. The breaking of a harpoon is of no less importance than the value of a whale, which is sometimes estimated at more than 1000*l.* sterling.

Next in importance to the harpoon, is the lance, (fig. 5.) which is a spear of iron of the length of six feet. It consists of a hollow socket six inches long, swelling from half an inch, the size of the shank, to near two inches in diameter, into which is fitted a four feet stock or handle of fir; a shank five feet long, and half an inch in diameter; and a mouth of steel, which is made very thin, and exceedingly sharp, seven or eight inches in length, and two or 2½ in breadth.

These two instruments, the harpoon and lance, with the necessary apparatus of lines, boats, and oars, are all that are essential for capturing the whale. But besides these instruments, so successfully used in the whale-fishery, there is likewise an auxiliary weapon which has, at different periods, been of some celebrity. This is the harpoon-gun.

It is well calculated to facilitate the capture of whales under particular circumstances, particularly in calm clear weather, when the fish are apt to take the alarm, whenever the boats approach within fifteen or twenty yards of them. The harpoon-gun was invented in the year 1731, and used, it seems, by some individuals with success. Being, however, difficult, and somewhat dangerous in its application, it was laid aside for many years. It has, however, subsequently been highly improved, and rendered capable of throwing a harpoon near forty yards with effect; yet, on account of the difficulty and address requisite in the management of it, and loss of fish, which, in unskilful hands it has been the means of occasioning, together with some accidents which have resulted from its use,—it has not been so generally adopted as might have been expected.

In its present improved form, the harpoon-gun consists of a kind of swivel, having a barrel of wrought iron, 24 to 26 inches in length, of 3 inches exterior diameter, and 1¾ inches bore. It is furnished with two locks, which act simultaneously, for the purpose of diminishing the liability of the gun missing fire. Fig. 1. is a representation of the harpoon-gun; and fig. 2. and 3. show the form of the harpoon which is fired from it. The shank of this harpoon is double, terminating in a cylindrical knob, fitting the bore of the gun. Between the two parts of the shank is a wire ring, to which is attached the line. Now, when the harpoon is introduced into the barrel of the gun, the

INSTRUMENTS USED IN THE CAPTURE OF SEA TURTLE

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ring, with the attached line, remains on the outside near the mouth of the harpoon; but the instant that it is fired, the ring flies back against the cylindrical knob. Some harpoons have been lately made with a single shank, similar to the common "hand-harpoon," but swelled at the end to the thickness of the bore of the gun. The whale line closely spliced round the shank, is slipped towards the mouth of the harpoon, when it is placed in the gun, and when fired, is prevented from disengaging itself, by the size of the knob at the end.

Proceedings on Fishing Stations.

On fishing stations, when the weather is such as to render the fishing practicable, the boats are always ready for instant service. Suspended from davits or cranes by the side of the ship, and furnished with the requisite implements, two boats at least, the crews of which are always in readiness, can, in a general way, be manned and lowered into the water, within the space of one minute of time.

Wherever there is a probability of seeing whales, when the weather and situation are such, as to present a possibility of capturing them, the crow's-nest*, is generally occupied by the master, or some

* The crow's-nest, is an apparatus placed on the main-topmast, or top-gallant-mast head, as a kind of watch tower, for the use of the master, or officer of the watch, in the fishing seas, for sheltering him from the wind, when en-

one of the officers, who, commanding from thence an extensive prospect of the surrounding sea, keeps an anxious watch for the appearance of a whale; assisted by a telescope, he views the operations of any ship which may be in sight at a distance; and occasionally sweeps the horizon with his glass, to extend the limited sphere of vision, in which he is able to discriminate a whale with the naked eye, to an area vastly greater. The moment that a fish is seen, he gives notice to the "watch upon deck," part of whom leap into a boat, are lowered down, and push off towards the place. If the fish be large, a second boat is immediately despatched to the support of the other. When the whale again appears, two boats row towards it with their utmost speed; and though they may be disappointed in all their attempts, they generally continue the pursuit, until the fish either takes the alarm, and escapes them, or they are recalled by signal to the ship. When two or more fish, appear at the same time in different situations, the number of boats, sent in pursuit, is commonly increased; and when the whole of the

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gaged in piloting the ship, through crowded ice, or for obtaining a more extensive view of the sea around, when looking out for whales. In difficult situations, a master's presence at the mast-head is sometimes required for many hours in succession, when the temperature of the air is from 10° to 20° degrees below the freezing point, or more. It is therefore necessary for the preservation of his health, as well as his comfort, that he should be sheltered from the gale.

boats are sent out, the ship is said to have "a loose fall."

During fine weather, in situations where whales are seen, or where they have recently been seen, or where there is a great probability of any making their appearance, a boat is generally kept in readiness, manned and afloat. If the ship sails with considerable velocity, this boat is towed by a rope astern; but when the ship is pretty still, whether moored to ice, laid to, or sailing in light winds, the "bran boat," as it is called, often pushes off to a little distance from the ship. A boat on watch, commonly lies still in some eligible situation, with all its oars elevated out of the water, but in readiness in the hands of the rowers for immediate use.

The harpooner and boat steerer, keep a careful watch on all sides, while each of the rowers looks out in the direction of his oar. In field fishing, the boats approach the ice with their sterns, and are each of them fastened to it, by means of a boat-hook, or an iron spike with a cord attached, either of which is held by the boat-steerer, and is slipped or withdrawn, the moment a whale appears. There are several rules observed in approaching a whale, as precautions, to prevent, as far as possible, the animal from taking the alarm. As the whale is dull of hearing, but quick of sight, the boat-steerer always endeavours to get behind it: and, in accomplishing this, he is sometimes justified in taking a circuitous route. In calm weather, where guns are

not used, the greatest caution is necessary, before a whale can be reached; smooth careful rowing is always requisite, and sometimes sculling is practised.

When it is known that a whale seldom abides longer on the water than two minutes, that it generally remains from five to ten or fifteen minutes under water;* that in this interval it sometimes moves through a space of half a mile or more,—and that the fisher has very rarely, any certain intimation of the place in which it will reappear;—the difficulty and address, requisite to approach sufficiently near, during its short stay on the surface, to harpoon it, will readily be appreciated. It is, therefore, a primary consideration with the harpooner always to place his boat as near as possible to the spot, in which he expects the fish to rise, and he conceives himself successful in the attempt when the fish "comes up within a start," that is, within the distance of about 200 yards. In all cases when a whale that is pursued, has but once been seen, the fisher is considerably indebted to what is called chance for a favourable position. But when the whale has been twice seen, and its change of place, if any, noticed, the harpooner makes the best use of the intimation derived from his observation on its

* Before I had particularly minuted the time, that a whale stays on the surface, and remains below, I believed each interval, and especially the former, was much greater than it really is.

apparent motion, and places his boat accordingly; thus he anticipates the fish in its progress, so that when it rises to the surface, there is probability of its being within the favourable precincts of a start.

A whale moving forward at a small distance beneath the surface of the sea, leaves a sure indication of its situation, in what is called an "eddy," having somewhat the resemblance of the "wake," or track of a ship, and in fine calm weather, its change of position is sometimes pointed out by the birds, many of which closely follow it when at the surface, and hover over it when below, whose keener vision can discover it, when it is totally concealed from human eyes. By these indications many whales have been taken.

Whenever a whale lies on the surface of the water, unconscious of the approach of its enemies, the hardy fisher rows directly upon it; and an instant before the boat touches it, buries his harpoon in its back. But if, while the boat is yet at a little distance, the whale should indicate his intention of diving, by lifting his head above its common level, and then plunging it under water, and raising his body until it appear like the large segment of a sphere,—the harpoon is thrown from the hand, or fired from a gun, the former of which, when skilfully practised, is efficient at the distance of eight or ten yards, and the latter at the distance of thirty yards, or upward. The wounded whale, in the surprise and agony of the moment, makes a convulsive ef-

fort to escape. Then is the moment of danger. The boat is subjected to the most violent blows from its head, or its fins, but particularly from its ponderous tail, which sometimes sweeps the air with such tremendous fury, that both boat and men are exposed to one common destruction.

The head of the whale is avoided, because it cannot be penetrated with the harpoon; but any part of the body, between the head and tail, will admit of the full length of the instrument, without danger of obstruction. The harpoon, therefore, is always struck into the back, and generally well forward towards the fins, thus affording the chance, when it happens to drag and plough along the back, of retaining its hold during a longer time, than when struck in closer to the tail.

The moment that the wounded whale disappears, or leaves the boat, a jack or flag, elevated on a staff, is displayed; on sight of which, those on watch in the ship, give the alarm, by stamping on the deck, accompanied by a simultaneous and continued shout of "a fall,"* at the sound of this, the sleeping crew are roused, jump from their beds, rush upon deck, with their clothes tied by a string in

* The word fall, as well as many others used in the fishery, is derived from the Dutch language. In the original it is written val, implying jump, drop, fall, and is considered as expressive of the conduct of the sailors, when manning the boats, on an occasion requiring extreme dispatch.

their hands, and crowd into the boats, with a temperature of zero. Should a fall occur, the crew would appear upon deck, shielded only by their drawers, stockings, and shirts, or other habiliments in which they sleep. They generally contrive to dress themselves, in part at least, as the boats are lowered down; but sometimes they push off in the state in which they rise from their beds, row away towards the "fast boat," and have no opportunity to clothe themselves for a length of time afterwards. The alarm of a "fall," has a singular effect on the feelings of a sleeping person, unaccustomed to the whale-fishing business. It has often been mistaken as a cry of distress. A landsman in a Hull ship, seeing the crew, on an occasion of a fall, rush upon deck, with their clothes in their hands, when there was no appearance of danger, thought the men were all mad; but, with another individual the effect was totally different. Alarmed with the extraordinary noise; and still more so, when he reached the deck, with the appearance of all the crew seated in the boats in their shirts, he imagined the ship was sinking. He therefore endeavoured to get into a boat himself, but every one of them being fully manned, he was always repulsed. After several fruitless endeavours to gain a place among his comrades, he cried out, with feelings of evident distress, "what shall I do?—Will none of you take me in?"

The first effort of a "fast fish," or whale that has been struck, is to escape from the boat, by sink-

ing under water. After this, it pursues its course directly downward, or re-appears at a little distance, and swims with great celerity, near the surface of the water, towards any neighbouring ice, among which it may obtain an imaginary shelter; or it returns instantly to the surface, and gives evidence of its agony, by the most convulsive throes, in which its fins and tail are alternately displayed in the air, and dashed into the water with tremendous violence. The former behaviour, however, that is, to dive towards the bottom of the sea, is so frequent, in comparison of any other, that it may be considered as the general conduct of a fast fish.

A whale struck near the edge of any large sheet of ice, and passing underneath it, will sometimes run the whole of the lines out of the boat, in the space of eight or ten minutes of time. This being the case, when the "fast-boat" is at a distance, both from the ship and from any other boat, it frequently happens that the lines are all withdrawn before assistance arrives, and, with the fish, entirely lost. In some cases, however, they are recovered. To retard, therefore, as much as possible, the flight of the whale, it is usual for the harpooner, who strikes it, to cast one, two, or more turns of line round a kind of post called a bollard; which is fixed within ten or twelve inches of the stem of the boat, for the purpose. Such is the friction of the line, when running round the bollard, that it frequently envelopes the harpooner in smoke; and if the wood were not repeatedly wetted, would

probably set fire to the boat. During the capture of one whale, a groove is sometimes cut in the bollard, near an inch in depth: and, were it not for a plate of brass, iron, or a block of lignum-vitæ, which covers the top of the stem where the line passes over, it is apprehended that the action of the line on the material of the boat, would cut it down to the water's edge, in the course of one season of successful fishing. The approaching distress of a boat, for want of line, is indicated by the elevation of an oar, in the way of a mast, to which is added a second, a third, or even a fourth, in proportion to the nature of the exigence. The utmost care and attention are requisite, on the part of every person in the boat, when the lines are running out; fatal consequences having been sometimes produced by the most trifling neglect. When the line happens "to run foul," and can not be cleared on the instant, it sometimes draws the boat under water; on which, if no auxiliary boat, or convenient piece of ice be at hand, the crew are plunged into the sea, and are obliged to trust to the buoyancy of their oars, or to their skill in swimming, for supporting themselves on the surface. To provide against such an accident, as well as to be ready to furnish an additional supply of lines, it is usual, when boats are sent in pursuit, for two to go out in company; and when a whale has been struck, for the first assisting boat which approaches, to join the fast-boat, and to stay by it until the fish re-appears. The other boats, likewise,

make towards the one carrying a flag, and surround it at various distances, awaiting the appearance of the wounded whale.

On my first voyage to the whale-fishery, such an accident, as above alluded to, occurred. A thousand fathoms of line were already out, and the fast-boat was forcibly pressed against the side of a piece of ice. The harpooner, in his anxiety to retard the flight of the whale, applied too many turns of the line round the bollard, which, getting entangled, drew the boat beneath the ice. Another boat, providentially, was at hand, into which the crew, including myself, who happened to be present, had just time to escape. The whale, with near two miles length of line, was, in consequence of the accident, lost, but the boat was recovered. On a subsequent occasion, I underwent a similar misadventure, but with a happier result; we escaped with a little wetting into an accompanying boat, and the whale was afterwards captured, and the boat with its lines recovered.

When fish have been struck by myself, I have on different occasions estimated their rate of descent. For the first 300 fathoms, the average velocity was usually after the rate of eight to ten miles per hour. In one instance, the third line of 120 fathoms was run out in 61 seconds; that is at the rate of 8$\frac{1}{2}$ English miles, or 7$\frac{1}{4}$ nautical miles per hour. By the motions of the fast-boat, the simultaneous movements of the whale are estimated. The auxiliary boats,

accordingly, take their stations about the situation where the whale, from these motions, may reasonably be expected to appear.

The average stay under water, of a wounded whale, which steadily descends after being struck, according to the most usual conduct of the animal, is about 30 minutes. The longest I ever observed was 56 minutes; but in shallow water, I have been informed, it has sometimes been known to remain an hour and a half at the bottom after being struck, and yet has returned to the surface alive. The greater the velocity, the more considerable the distance to which it descends; and the longer the time it remains under water, so much greater in proportion is the extent of its exhaustion and the consequent facility of accomplishing its capture. Immediately that it reappears, the assisting boats make for the place with their utmost speed, and as they reach it, each harpooner plunges his harpoon into its back, to the amount of three, four, or more, according to the size of the whale, and the nature of the situation. Most frequently, however, it descends for a few minutes after receiving the second harpoon, and obliges the other boats to await its return to the surface, before any further attack can be made. It is afterwards actively plied with lances, which are thrust into its body, aiming at its vitals. At length, when exhausted by numerous wounds and the loss of blood, which flows from the huge animal in copious streams, it indicates the approach of its dis-

solution, by discharging from its "blowholes," a mixture of blood along with the air and mucus which it usually expires, and finally jets of blood alone. The sea, to a great extent around, is dyed with its blood, and the ice, boats, and men, are sometimes drenched with the same. Its track is likewise marked by a broad pellicle of oil, which exudes from its wounds, and appears on the surface of the sea. Its final capture is sometimes preceded by a convulsive struggle, in which, its tail, reared, whirled, and violently jerked in the air, resounds to the distance of miles. In dying, it turns on its back or on its side; which joyful circumstance is announced by the captorers with the striking of their flags, accompanied by three lively huzzas!

The remarkable exhaustion observed in the first appearance of a wounded whale at the surface, after a descent of 700 or 800 fathoms perpendicular, does not depend on the nature of the wound it has received; for a hundred superficial wounds received from harpoons, could not have the effect of a single lance penetrating the vitals, but is the effect of the almost incredible pressure to which the animal must have been exposed. The surface of the body of a large whale, may be considered as comprising an area of 1540 square feet. This, under the common weight of the atmosphere only, must sustain a pressure of 3,104,640 pounds, or 1386 tons. But at the depth of 800 fathoms, where there is a column

of water equal in weight to about 154 atmospheres, the pressure on the animal must be equal to 211,200 tons.* This is a degree of pressure of which we can have but an imperfect conception. It may assist our comprehension, however, to be informed, that it exceeds in weight sixty of the largest ships of the British navy when manned, provisioned, and fitted for a six months cruise.

Every boat fast to a living whale carries a flag, and the ship to which such boats belong, also wears a flag, until the whale is either killed or makes its escape. These signals serve to indicate to surrounding ships the exclusive title of the "fast ship," to the entangled whale, and to prevent their interference, excepting in the way of assistance, in the capture.

A very natural inquiry connected with this subject, is, what is the length of time requisite for cap-

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* From experiments made with sea-water taken up near Spitzbergen, I find that 35 cubical feet weigh a ton. Now supposing a whale to descend to the depth of 800 fathoms or 4800 feet, which, I believe, is not uncommon, we have only to divide 4800 feet, the length of the column of water pressing upon the whale, by 35 feet, the length of a column of sea-water a foot square, weighing a ton, the quotient 137 1-7, shows the pressure per square foot upon the whale, in tons; which multiplied by 1540, the number of square feet of surface exposed by the animal, affords a product of 211,200 tons, besides the usual pressure of the atmosphere.

turing a whale? This is a question which can only be answered indirectly; for I have myself witnessed the capture of a large whale, which has been effected in twenty-eight minutes; and have also been engaged with another fish which was lost, after it had been entangled about sixteen hours. Instances are well authenticated, in which whales have yielded their lives to the lances of active fishers, within the space of fifteen minutes from the time of being struck; and in cases when fish have been shot with a harpoon-gun, in a still shorter period; while other instances are equally familiar and certain, wherein a whale having gained the shelter of a pack or compact patch of ice, has sustained or avoided every attack upon it, during the space of forty or fifty hours. Some whales have been captured when very slightly entangled with a single harpoon, while others have disengaged themselves, though severely wounded with lances, by a single act of violent and convulsive distortion of the body, or tremendous shake of the tail, from four or more harpoons; in which act, some of the lines have been broken with apparent ease, and the harpoons, to which other lines were attached, either broken or torn out of the body of the vigorous animal. Generally, the speedy capture of a whale depends on the activity of the harpooners, the favourableness of situation and weather, and, in no inconsiderable degree, on the peculiar conduct of the whale attacked. Under the most favourable circumstances,

namely, when the fishermen are very active, the ice very open, or the sea free from ice and the weather fine,—the average length of time occupied in the capture of a whale, may be stated as not exceeding an hour.* The general average, including all sizes of fish, and all circumstances of capture, may probably be two or three hours.

The method practised in the capture of whales, under favourable circumstances, is very uniform with all the fishers, both British and foreigners. The only variation observable in the proceedings of the different fishers, consisting in the degree of activity and resolution displayed, in pursuance of the operations of harpooning and lancing the whale, and in the address manifested in improving by any accidental movement of the fish, which may lay it open to an effectual attack,—rather than in any thing different or superior in the general method of conducting the fishery. It is true, that with some the harpoon-gun is much valued, and used with advantage, while with others, it is held in prejudiced aversion; yet, as this difference of opinion affects

* Twelve large whales, taken in different voyages, memoranda of whose capture I have preserved, were killed, on an average, in 67 minutes. The shortest time expended in the taking of one of the twelve whales, was 28 minutes, the longest time 2 hours. One of these whales we believed, descended 670 fathoms perpendicular; another 720, and a third 750, one descended 1400 fathoms obliquely and another 1200 fathoms.

only the first attack and entanglement of the whale, the subsequent proceedings with all the fishers, may still be said to be founded on equal and unanimous principles. Hence, the mode described in the preceding pages, of conducting the fishery for whales under favourable circumstances, may be considered as the general plan pursued by all the fishers of all the ports of Britain, as well as those of the nations who resort to Spitzbergen. Neither is there any difference in the plan of attack, or mode of capture between fish of large size, and those of lesser growth; the proceedings are the same, but, of course, with the smaller whales less force is requisite; though it sometimes happens, that the trouble attached to the killing of a very small whale, exceeds that connected with the capture of one of the largest individuals. The progress or flight of a large whale can not be restrained; but that of an under size fish may generally be confined within the limits of 400 to 600 fathoms of line. A full grown fish generally occupies the whole, or nearly the whole, of the boats belonging to one ship in its capture; but three, four, or sometimes more small fish, have been killed at the same time, by six or seven boats. It is not unusual for small whales to run downward, until they exhaust themselves so completely, that they are not able to return to the surface, but are suffocated in the water. As it is requisite that a whale that has been drowned should be drawn up by the line, which is a tedious and troublesome

operation, it is usual to guard against such an event by resisting its descent with a light strain on the line, and also by hauling upon the line, the moment its descent is stopped, with a view of irritating the wound, and occasioning such a degree of pain, as may induce it to return to the surface, where it can be killed and secured without further trouble. Seldom more than two harpoons are struck into an under size whale.

The ease with which some whales are subdued, and the slightness of the entanglement by which they are taken, is truly surprising; but with others it is equally astonishing, that neither line nor harpoon, nor any number of each, is sufficiently strong to effect their capture. Many instances have occurred where whales have escaped, from four, five, or even more harpoons, while fish, equally large, have been killed through the medium of a single harpoon. Indeed, whales have been taken in consequence of the entanglement of a line, without any harpoon at all; though, when such a case has occurred, it has evidently been the result of accident. The following instances are in point.

A whale was struck from one of the boats of the ship Nautilus, in Davis's Straits. It was killed, and as is usual after the capture, it was disentangled of the line connected with the "first fast-boat," by dividing it at the splice of the foreganger, within eight or nine yards of the harpoon. The crew of the boat from which the fish was first struck, in the

meantime were employed in heaving in the lines, by means of a winch fixed in the boat for the purpose, which they progressively effected for some time. On a sudden, however, to their great astonishment, the lines were pulled away from them, with the same force and violence, as by a whale when first struck. They repeated their signal, indicative of a whale being struck; their shipmates flocked towards them, and while every one expressed a similar degree of astonishment with themselves, they all agreed that a fish was fast to the line. In a few minutes, they were agreeably confirmed in their opinion, and relieved from suspense, by the rising of a large whale close by them, exhausted with fatigue, and having every appearance of a fast-fish. It permitted itself to be struck by several harpoons at once, and was speedily killed. On examining it after death, for discovering the cause of such an interesting accident, they found the line, belonging to the above mentioned boat, in it smouth, where it was still firmly fixed by the compression of its lips. The occasion of this happy and puzzling accident, was therefore solved;—the end of the line, after being cut from the whale first killed, was in the act of sinking in the water; the fish in question, engaged in feeding, was advancing with its mouth wide open, and accidentally caught the line between its extended jaws;—a sensation so utterly unusual as that produced by the line, had induced it to shut its mouth and grasp the line, which was the cause of its alarm,

so firmly between its lips, as to produce the effect just stated. This circumstance took place many years ago, but a similar one occurred in the year 1814.

A harpooner, belonging to the Prince of Brazil, of Hull, had struck a small fish. It descended, and remained for some time quiet, and at length appeared to be drowned. The strain on the line being then considerable, it was taken to the ship, with a view of heaving the fish up. The force requisite for performing this operation, was extremely various; sometimes, the line came in with ease, at others, a quantity was withdrawn with great force and rapidity. As such, it appeared evident that the fish was yet alive. The heaving, however, was persisted in, and after the greater part of the lines had been drawn on board, a dead fish appeared at the surface, secured by several turns of the line round its body. It was disentangled with difficulty, and was confidently believed to be the whale they had struck. But when the line was cleared from the fish, it proved to be merely the "bight," for the end still hung perpendicularly downward. What was then their surprise to find that it was still pulled away with considerable force. The capstern was again resorted to, and shortly afterwards, they hove up, also dead, the fish originally struck, with the harpoon still fast. Hence it appeared, that the fish first drawn up, had got accidentally entangled with the line, and in its struggles to escape, had still fur-

ther involved itself, by winding the line repeatedly round its body. The first fish entangled, as was suspected, had long been dead; and it was this lucky interloper, that occasioned the jerks and other singular effects observed on the line.

Alterations produced in the manner of conducting the Fishery, by peculiar Circumstances of Situation and Weather.

Hitherto I have only attempted to describe the method adopted for the capture of whales, under favourable circumstances, such as occur in open water or amongst open ice in fine weather; as, however, this method is subject to various alterations, when the situation and circumstances are peculiar, I shall venture a few remarks on the subject.

1. *Pack-fishing.*—The borders of close packs of drift ice are frequently a favourite resort of large whales. To attack them in such a situation, subjects the fisher to great risk in his lines and boats, as well as uncertainty in effecting their capture. When a considerable swell prevails on the borders of the ice, the whales, on being struck, will sometimes recede from the pack, and become the prize of their assailers; but most generally flee to it for shelter, and frequently make their escape. To guard against the loss of lines as much as possible, it is pretty usual either to strike two harpoons from different boats at the same moment, or to bridle the lines of

a second boat upon those of the boat from which the fish is struck. This operation consists in fixing other lines to those of the fast-boat at some distance from the harpoon, so that there is only one harpoon and one line immediately attached to the fish, but the double strength of a line from the place of their junction to the boats. Hence, should fish flee directly into the ice, and proceed to an inaccessible distance, the two boats, bearing an equalstra in on each of their lines, can at pleasure draw the harpoon, or break the single part of the line immediately connected with it, and in either case, secure themselves against any considerable loss.

When a pack, for its compactness, prevents boats from penetrating, the men travel over the ice, leaping from piece to piece, in pursuit of the entangled whale. In this pursuit, they carry lances with them and sometimes harpoons, with which, whenever they can approach the fish, they attack it, and if they succeed in killing it, they drag it towards the exterior margin of the ice, by means of the line fastened to the harpoon with which it was originally struck. In such cases, it is generally an object of importance to sink it beneath the ice; for effecting which purpose, each lobe of the tail is divided from the body, excepting a small portion of the edge, from which it hangs pendulous in the water. If it still floats, bags of sand, kedges or small cannon, are suspended by a block on the bight of the line, wherewith the buoyancy of the dead whale is usu-

ally overcome. It then sinks, and is easily hauled out by the line into the open sea.

To particularize all the variety of pack-fishing, arising from winds and weather, size of the fish, state and peculiarities of the ice, &c. would require more space than the interest of the subject, to general readers, would justify. I shall, therefore, only remark, that pack-fishing is, on the whole, the most troublesome and dangerous of all others;—that instances have occurred of fish having been entangled during 40 or 50 hours, and have escaped after all;—and that other instances are remembered, of ships having lost the greater part of their stock of lines, several of their boats, and sometimes, though happily, less commonly, some individuals of their crews.

2. *Field-fishing.*—The fishery for whales, when conducted at the margin of those wonderful sheets of solid ice, called fields, is, when the weather is fine, and the refuge for ships secure, of all other situations which the fishery of Greenland presents, the most agreeable and sometimes the most productive. A fish struck at the margin of a large field of ice, generally descends obliquely beneath it, takes four to eight lines from the fast-boat, and then returns exhausted to the edge. It is then attacked in the usual way, with harpoons and lances, and is easily killed. There is one evident advantage in field-fishing, which is this: When the fast-boat lies at the edge of a firm unbroken field, and the

line proceeds in an angle beneath the ice, the fish must necessarily arise somewhere in a semicircle, described from the fast-boat as a centre, with a sweep not exceeding the length of the lines out; but most generally it appears in a line extending along the margin of the ice, so that the boats, when dispersed along the edge of the field, are effectual and as ready for promoting the capture as twice the number of boats or more, when fishing in open situations; because, in open situations, the whale may arise any where within a circle, instead of a semicircle, described by the length of the lines withdrawn from the fast-boat; whence, it frequently happens, that all the attendant boats are disposed in a wrong direction, and the fish recovers its breath, breaks loose, and escapes before any of them can secure it by a second harpoon. Hence, when a ship fishes at a field with an ordinary crew, and six or seven boats, two of the largest fish may be struck at the same time with every prospect of success; while the same force attempting the capture of two at once in an open situation, will, not unfrequently, occasion the loss of both. There have indeed been instances of a ship's crew, with seven boats, striking at a field, six fish at the same time, and of success in killing the whole. Generally speaking, six boats at a field are capable of performing the same execution as near twice that number in open situations. Besides, fields sometimes afford an opportunity of fishing, when in any other situation there can be little or no

chance of success, or, indeed, when to fish elsewhere is utterly impracticable. Thus calms, storms, and fogs, are great annoyances in the fishery in general, and frequently prevent it altogether; but at fields the fishery goes on under any of these disadvantages. As there are several important advantages attending the fishery at fields, so, likewise, there are some serious disadvantages, chiefly relating to the safety of the ships engaged in the occupation. The motions of fields are rapid, various, and unaccountable, and the power with which they approach each other, and squeeze every resisting object, immense,—hence occasionally vast mischief is produced, which it is not always in the power of the most skilful and attentive master to foresee and prevent.

Such are the principal advantages and disadvantages of fields of ice to the whale-fishers. The advantages, however, as above enumerated, though they extend to large floes, do not extend to small floes, or to such fields, how large soever they may be, as contain tracks or holes, or are filled up with thin ice on the interior. Large and firm fields are the most convenient, and likewise the most advantageous for the fishery; the most convenient, because the whales, unable to breathe beneath a close extensive field of ice, are obliged to make their appearance again above water among the boats on the look out; and they are most advantageous, because not only the most fish commonly resort to them, but a

greater number can be killed with less force, and in a short space of time, than in any other situation. Thin fields, or fields full of holes, being by no means advantageous to fish by, are usually avoided, because a "fast-fish," retreating under such a field, can respire through the holes in the centre as conveniently as on the exterior; and a large fish usually proceeds from one hole to another, and if determined to advance can not possibly be stopped. In this case, all that can be done is, to break the line or draw the harpoon out. But when the fish can be observed "blowing," in any of the holes in a field, the men travel over the ice and attack it with lances, pricking it over the nose, to endeavour to turn it back. This scheme, however, does not always answer the expectations of the fishers, as frequently the fear of his enemies acts so powerfully on the whale, that he pushes forward to the interior to his dying moment. When killed, the same means are used as in pack-fishing, to sink it, but they do not always succeed; for the harpoon is frequently drawn out, or the line broken in the attempt. If, therefore, no attempt to sink the fish avails, there is scarcely any other practicable method of making prize of it, (unless when the ice happens to be so thin that it can be broken with a boat, or a channel readily cut in it with an ice saw,) than cutting the blubber away, and dragging it piece by piece across the ice to the vessel, which requires immense labour and is attended with vast loss of time. Hence, we

have a sufficient reason for avoiding such situations whenever fish can be found elsewhere. As connected with this subject, I can not pass over a circumstance which occurred within my own observation, and which excited my highest admiration.

On the 8th of July, 1813, the ship Esk lay by the edge of a large sheet of ice, in which were several thin parts, and some holes. Here a fish being heard blowing, a harpoon, with a line connected to it, was conveyed across the ice, from a boat on guard, and the harpooner succeeded in striking the whale, at the distance of 350 yards from the verge. It dragged out ten lines, (2400 yards,) and was supposed to be seen blowing in different holes in the ice. After some time, it happened to make its appearance on the exterior, when a harpoon was struck at the moment it was on the point of proceeding again beneath. About a hundred yards from the edge, it broke the ice where it was a foot in thickness, with its crown, and respired through the opening. It then determinately pushed forward, breaking the ice as it advanced, in spite of the lances constantly directed against it. It reached at length a kind of bason in the field, where it floated on the surface of the water, without any incumbrance from ice. Its back being fairly exposed, the harpoon, struck from the boat on the outside, was observed to be so slightly entangled, that it was ready to drop out. Some of the officers lamented this circumstance, and expressed a wish that the harpoon were better fast,

observing, at the same time, that if it should slip out, the fish would either be lost, or they would be under the necessity of flensing it where it lay, and of dragging the pieces of blubber over the ice to the ship; a kind and degree of labour, every one was anxious to avoid. No sooner was the wish expressed, and its importance made known, than one of the sailors, a smart and enterprising fellow, stept forward and volunteered his services to strike it better in. Not at all intimidated by the surprise which was manifested in every countenance, by such a bold proposal, he pulled out his pocket-knife, leapt upon the back of the living whale, and immediately cut the harpoon out. Stimulated by this courageous example, one of his companions proceeded to his assistance. While one of them hauled upon the line and held it in his hands, the other set his shoulder against the extremity of the harpoon, and though it was without a stock, he contrived to strike it again into the fish more effectually than it was at first; the fish was in motion before they finished. After they got off its back, it advanced a considerable distance, breaking the ice all the way, and survived this uncommon treatment, ten or fifteen minutes. This admirable act was an essential benefit. The fish fortunately sunk spontaneously, after being killed, on which it was hauled out to the edge of the ice by the line, and secured without further trouble. It proved a stout whale, and a very acceptable prize.

When a ship approaches a considerable field of ice, and finds whales, it is usual to moor to the leeward side of it, from which the adjoining ice usually first separates. Boats are then placed on watch, on each side of the ship, and stationed at intervals of 100 or 150 yards from one another, along the edge of the ice. Hence, if a fish arises any where between the extreme boats, it seldom escapes unhurt. It is not uncommon for a great number of ships to moor to the same sheet of ice. When the whale fishery of the Hollanders was in a flourishing state, above 100 sail of ships might sometimes be seen moored to the same field of ice, each having two or more boats on watch. The field would, in consequence, be so nearly surrounded with boats, that it was almost impossible for a fish to rise near the verge of the ice, without being within the limits of a start of some of them.

3. *Fishing in crowded ice, or in open packs.*—In navigably open drift ice, or among small detached streams and patches, either of which serve in a degree to break the force of the sea, and to prevent any considerable swell from arising, we have a situation, which is considered as one of the best possible for conducting the fishery in; consequently, it comes under the same denomination as those favourable situations, in which I have first attempted to describe the proceedings of the fishers in killing the whale. But the situation I now mean to refer to, is, when the ice is crowded and nearly close; so

close, indeed, that it scarcely affords room for boats to pass through it, and by no means sufficient space for a ship to be navigated among it. This kind of situation occurs in somewhat open packs, or in large patches of crowded ice, and affords a fair probability of capturing a whale, though it is seldom accomplished without a considerable degree of trouble. When the ice is very crowded, and the ship can not sail into it with propriety, it is usual to seek out for a mooring to some large mass of ice, if such can be found, extending two or three fathoms or more, under water. A piece of ice of this kind, is capable not only of holding the ship "head-to-wind," but also to windward of the smaller ice. The boats then set out in chase of any fish which may be seen; and when one happens to be struck, they proceed in the capture in a similar manner as when in more favourable circumstances, excepting so far as the obstruction which the quality and arrangement of the ice may offer, to the regular system of proceeding. Among crowded ice, for instance, the precise direction pursued by the fish is not easily ascertained, nor can the fish itself be readily discovered on its first arrival at the surface, after being struck, on account of the elevation of the intervening masses of ice, and the great quantity of line it frequently takes from the fast-boat. Success in such a situation, depends on the boats being spread widely abroad, and on a judicious arrangement of each boat; on a keen look out on the part

of the harpooners in the boat, and on their occasionally taking the benefit of a hummock of ice, from the elevation of which the fish may sometimes be seen "blowing" in the interstices of the ice; on pushing or rowing the boats with the greatest imaginable celerity, towards the place where the fish may have been seen; and, lastly, on the exercise of the highest degree of activity and despatch in every proceeding.

If these means be neglected, the fish will generally have taken his breath, renewed its strength, and removed to some other quarter, before the arrival of the boats; and it is often remarked, that if there be one part of the ice more crowded or more difficult of access than another, it commonly retreats thither for refuge. In such cases, the sailors find much difficulty in getting to it with their boats, having to separate many pieces of ice before they can pass through between them. But when it is not practicable to move the pieces, and when they can not travel over them, they must either drag the boats across the intermediate ice, or perform an extensive circuit, before they can reach the opposite side of the close ice, into which the whale has retreated.

A second harpoon, in this case, as indeed in all others, is a material point. They proceed to lance whenever a second harpoon is struck, and strike more harpoons as the auxiliary boats progressively arrive at the place.

When the fish is killed, it is often at a distance from the ship, and so circumstanced, that the ship can not get near it. In such cases, the fish must be towed by the boats to the ship; an operation which, in crowded ice, is most troublesome and laborious.

4. *Bay-ice fishing.*—Bay-ice constitutes a situation, which, though not particularly dangerous, is yet, on the whole, one of the most troublesome in which whales are killed. In sheets of bay-ice, the whales find a very effectual shelter; for so long as the ice will not "carry a man," they can not be approached with a boat, without producing such a noise, as most certainly warns them of the intended assault. And if a whale, by some favourable accident, were struck, the difficulties of completing the capture are always numerous, and sometimes prove insurmountable. The whale having free locomotion beneath the ice, the fishers pursue it under great disadvantage. The fishers can not push their boats towards it but with extreme difficulty; while the whale, invariably warned by the noise of their approach, possesses every facility for avoiding its enemies. In the year 1813, I adopted a new plan of fishing in bay-ice, which was attended with the most fortunate result. The ship under my command (the Esk of Whitby) was frozen into a sheet of bay-ice, included in a triangular space, formed by massive fields and floes. Here a number of small whales were seen sporting around us, in

every little hole or space in the bay-ice, and occasionally they were observed to break through it, for the purpose of breathing. In various little openings, free of ice, near the ship, few of which were twenty yards in diameter, we placed boats; each equipped with a harpoon and lines, and directed by two or three men. They had orders to place themselves in such a situation, that if a fish appeared in the same opening, they could scarcely fail of striking it. Previous to this, I provided myself with a pair of ice shoes, consisting of two pieces of thin deal, six feet in length, and seven in breadth. They were made very thin at both ends; and, in the centre of each, was a hollow place exactly adapted for the reception of the sole of my boot, with a loop of leather for confining the toes. I was thus enabled to retain the ice shoes pretty firmly to my feet, when required, or, when I wished it, of disengaging them in a moment. Where the ice was smooth, it was easy to move in a straight line; but, in turning, I found a considerable difficulty, and required some practice before I could effect it, without falling. I advanced, with tolerable speed, when the ice was level on the surface, by sliding the shoes alternately forward, but when I met with rough hilly places, I experienced great inconvenience. When, however, the rough places happened to consist of strong ice, which generally was the case, I stepped out of my ice shoes, until I reached a weaker part. Equipped with this apparatus, I

travelled safely over ice which had not been frozen above twenty-four hours, and which was incapable of supporting the weight of the smallest boy in the ship.

Whenever a fish was struck, I gave orders to the harpooner, in running the lines, to use every means of drowning it; the trouble of hauling it up, under the circumstances in which the ship was placed, being a matter of no consideration. This was attempted, by holding a steady tight strain on the line, without slacking it or jerking it unnecessarily, and by forbearing to haul at the line when the fish was stopped. By this measure, one fish, the stoutest of the three we got, was drowned. When others were struck, and the attempt to drown them failed, I provided myself with a harpoon; and, observing the direction of the line, travelled towards the place where I expected the fish to rise. A small boat was launched, more leisurely, in the same direction, for my support; and whenever the ice in my track was capable of supporting a man, assistance was afforded me in dragging the line. When the wounded fish appeared, I struck my harpoon through the ice, and then, with some occasional assistance, proceeded to lance it, until it was killed. At different times the fish rose beneath my feet, and broke the ice on which I stood; on one occasion, when the ice was fortunately more than usually strong, I was obliged to leave my ice-shoes and skip off. In this way we captured three fish, and

took their produce on board, while several ships near us made not the least progress in the fishery. After they were killed, we had much trouble in getting them to the ship, but as we could not employ ourselves to advantage in any other way, we were well satisfied with the issue. This part of the business, however, I could not effect alone, and all hands who were occasionally employed in it, broke through the ice. Some individuals broke in two or three times, but no serious accident ensued. As a precaution, we extended a rope from man to man, which was held in the hands of each in their progress across the ice, and which served for drawing those out of the water who happened to break through. Sometimes ten or a dozen of them would break in at once; but so far was such an occurrence from exciting distress, that each of their companions indulged a laugh at their expense, notwithstanding they, probably, shared the same fate a minute or two afterwards. The shivering tars were, in general, amply repaid for the drenching they had suffered, by a dram of spirits, which they regularly received on such occasions. I have seen instances, indeed, of sailors having voluntarily broken through the ice, for the mere purpose of receiving the usual precious beverage.

5. *Fishing in Storms.*—Excepting in situations sheltered from the sea by ice, it would be alike useless and presumptuous to attempt to kill whales during a storm. Cases, however, occur, wherein

fish that were struck during fine weather, in winds which do not prevent the boats from plying about, remain entangled, but unsubdued, after the commencement of a storm. Sometimes the capture is completed, at others the fishers are under the necessity of cutting the lines, and allowing the fish to escape. Sometimes, when they have succeeded in killing it, and in securing it during the gale with a hawser to the ship, they are enabled to make a prize of it on the return of moderate weather; at others, after having it to appearance secured, by means of a sufficient rope, the dangerous proximity of a lee pack constrains them to cut it adrift and abandon it, for the preservation of their vessel. After thus being abandoned, it becomes the prize of the first who gets possession of it, though it be in the face of the original capturers. A storm commencing while the boats are engaged with an entangled fish, sometimes occasions serious disasters. Generally, however, though they suffer the loss of the fish, and perhaps some of their boats and materials, yet the men escape with their lives.

6. *Fishing in Foggy Weather.*—The fishery in storms, in exposed situations, can never be voluntary, as the case only happens when a storm arises subsequent to the time of a fish being struck; but in foggy weather, though occasionally attended with hazard, the fishery is not altogether impracticable. The fogs which occur in the icy regions in June and July, are generally dense and lasting. They

are so thick, that objects can not be distinguished at the distance of 100 or 150 yards, and frequently continue for several days without attenuation. To fish with safety and success, during a thick fog, is, therefore, a matter of difficulty, and of still greater uncertainty. When it happens that a fish conducts itself favourably, that is, descends almost perpendicularly, and on its return to the surface remains nearly stationary, or moves round in a small circle, the capture is usually accomplished without hazard or particular difficulty; but when, on the contrary, it proceeds with any considerable velocity in a horizontal direction, or obliquely downwards, it soon drags the boats out of sight of the ship, and shortly so confounds the fishers in the intensity of the mist, that they lose all traces of the situation of their vessel. If the fish, in its flight, draws them beyond the reach of the sound of a bell, or a horn, their personal safety becomes endangered; and if they are removed beyond the sound of a cannon, their situation becomes extremely hazardous, especially if no other ships happen to be in the immediate vicinity. Meanwhile, whatever may be their imaginary or real danger, the mind of their commander must be kept in the most anxious suspense until they are found; and whether they may be in safety, or near perishing with fatigue, hunger and cold, so long as he is uncertain, his anxiety must be the same. Hence it is, that feelings excited by uncertainty are frequently more violent and distress-

ing than those produced by the actual knowledge of the truth.

Keen and vigilant observance of the direction pursued by the whale, on the part of the persons engaged in the chase, and a corresponding observance of the same by their commanders, can be the only means within the power of each party of securing the ship and boats from being widely separated, without knowing what course to pursue for re-uniting them. Much depends on the people employed in the boats using every known means to arrest the progress of the fish in its flight, by attacking it with the most skilful, active, and persevering efforts, until it is killed; and then, as speedily as may be, of availing themselves of the intimation they may possess relative to the position of the ship, for the purpose of rejoining her. But as their knowledge of the direction of their movements generally depends on the wind, unless they happen to be provided with a compass, and have attentively marked their route by its indications, any change in the direction of the wind, must be attended with serious consequences.

Anecdotes illustrative of Peculiarities in the Whale Fishery.

On the 25th of June, 1812, one of the harpooners belonging to the Resolution, of Whitby, under my command, struck a whale by the edge of a small

floe of ice. Assistance being promptly afforded, a second boat's lines were attached to those of the fast-boat; in a few minutes after the harpoon was discharged. The remainder of the boats proceeded to some distance, in the direction the fish seemed to have taken. In about a quarter of an hour the fast-boat, to my surprise, again made a signal for lines. As the ship was then within five minutes sail, we instantly steered towards the boat, with the view of affording assistance, by means of a spare boat we still retained on board. Before we reached the place, however, we observed four oars displayed in signal order, which, by their number, indicated a most urgent necessity for assistance. Two or three men were, at the same time, seated close by the stern, which was considerably elevated, for the purpose of keeping it down,—while the bow of the boat, by the force of the line, was drawn down to the level of the sea,—and the harpooner, by the friction of the line round the bollard, was enveloped in smoky obscurity. At length, when the ship was scarcely 100 yards distant, we perceived preparations for quitting the boat. The sailors' *pea*-jackets were cast upon the adjoining ice,—the oars were thrown down,—the crew leaped overboard,—the bow of of the boat was buried in the water,—the stern rose perpendicular, and then majestically disappeared. The harpooner having caused the end of the line to be fastened to the iron ring at the boat's stern, was

the means of its loss;* and a *tongue* of the ice, on which was a depth of several feet of water, kept the boat, by the pressure of the line against it, at such a considerable distance as prevented the crew from leaping upon the floe. Some of them were, therefore, put to the necessity of swimming for their preservation, but all of them succeeded in scrambling upon the ice, and were taken aboard of the ship a few minutes afterwards. I may here observe, that it is an uncommon circumstance for a fish to take more than two boats' lines in such a situation;—none of our harpooners, therefore, had any scruple in leaving the fast-boat, never suspecting, after it had received the assistance of one boat, with six lines or upwards, that it would need any more.

Several ships being about us, there was a possibility that some person might attack and make a prize of the whale, when it had so far escaped us, that we no longer retained any hold of it; as such, we set all sail the ship could safely sustain, and worked through several narrow and intricate channels in the ice, in the direction I observed the fish had retreated. After a little time, it was de-

* "Giving a whale the boat" as the voluntary sacrifice of a boat is termed, is a scheme not unfrequently practised by the fisher, when in want of line. By submitting to this risk, he expects to gain the fish, and still has the chance of recovering his boat and its materials. It is only practised in open ice or at fields.

scried by the people in the boats, at a considerable distance to the eastward; a general chase immediately commenced, and in the space of an hour three harpoons were struck. We now imagined the fish was secure, but our expectations were premature. The whale resolutely pushed beneath a large floe that had recently been broke to pieces by the swell, and soon drew all the lines out of the second fast-boat, the officer of which, not being able to get any assistance, tied the end of his line to a hummock of ice, and broke it. Soon afterwards, the other two boats, still *fast*, were dragged against the broken floe, when one of the harpoons drew out. The line of only one boat, therefore, remained fast to the fish, and with six or eight lines out, was dragged forward into the shattered floe with astonishing force. Pieces of ice, each of which was sufficiently large to have answered the purpose of mooring a ship, were wheeled about by the strength of the whale; and such was the tension and elasticity of the line, that whenever it slipped clear of any mass of ice, after turning it round, into the space between any two adjoining pieces, the boat and its crew flew forward through the creek, with the velocity of an arrow, and never failed to launch several feet upon the first mass of ice that it encountered.

While we scoured the sea, around the broken floe with the ship, and while the ice was attempted in vain by the boats, the whale continued to press forward in an easterly direction towards the sea.

At length, when fourteen lines (about 1680 fathoms) were drawn from the fourth fast-boat, a slight entanglement of the line broke it at the stem. The fish then again made its escape, taking along with it a boat and twenty-eight lines. The united length of the lines was 6720 yards, or upwards of 3¾ English miles; value, with the boat, above 150 pounds sterling.

The obstruction of the sunken boat, to the progress of the fish, must have been immense; and that of the lines likewise considerable; the weight of the lines alone, being 35 hundred weight.

So long as the fourth fast-boat, through the medium of its lines, retained its hold of the fish, we searched the adjoining sea with the ship in vain; but, in a short time after the line was divided, we got sight of the object of pursuit, at the distance of near two miles to the eastward of the ice and boats, in the open sea. One boat only with lines, and two empty boats, were reserved by the ship. Having, however, fortunately fine weather, and a fresh breeze of wind, we immediately gave chase under all sails; though, it must be confessed, with the insignificant force by us, the distance of the fish, and the rapidity of its flight considered, we had but very small hopes of success. At length, after pursuing it five or six miles, being at least nine miles from the place where it was struck, we came up with it, and it seemed inclined to rest after its extraordinary exertions. The two dismantled or

empty boats having been furnished with two lines each, (a very inadequate supply,) they, together with the one in a good state of equipment, now made an attack upon the whale. One of the harpooners made a blunder; the fish saw the boat, took the alarm, and again fled. I now supposed it would be seen no more; nevertheless, we chased nearly a mile in the direction I imagined it had taken, and placed the boats, to the best of my judgment, in the most advantageous situations. In this case we were extremely fortunate. The fish rose near one of the boats, and was immediately harpooned. In a few minutes, two more harpoons entered its back, and lances were plied against it with vigour and success. Exhausted by its amazing exertions to escape, it yielded itself at length to its fate, received the piercing wounds of the lances without resistance, and finally died without a struggle. Thus terminated with success, an attack upon a whale, which exhibited the most uncommon determination to escape from its pursuers, seconded by the most amazing strength of any individual whose capture I ever witnessed. After all, it may seem surprising, that it was not a particularly large individual; the largest lamina of whalebone only measuring nine feet six inches, while those affording twelve feet bone are not uncommon.* The quantity of line

* It has been frequently observed, that whales of this size are the most active of the species; and those of very large growth are, in general, captured with less trouble.

withdrawn from the different boats engaged in the capture, was singularly great. It amounted, altogether, to 10,440 yards,* or nearly six English miles. Of these, thirteen new lines lost, together with the sunken boat; the harpoon connecting them to the fish, having dropt out before the whale was killed.

After having taken a large circuit with the ship Esk in the open sea in search of whales, we saw two or three individuals, when at the distance of about twenty miles from the middle hook of the Foreland,† The weather was fine and no ice in sight. A boat was despatched towards one of the fish we saw, which was immediately struck. The men

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* The following is a correct statement of the quantity of lines withdrawn from each of the fast-boats, viz.

	Yards.
From the first fast-boat 13 new lines, (the whole of which, together with the boat, were lost,) harpoon drew,	3120
From the second fast-boat 6½ lines; line broke,	1560
——— third do 3½ lines; harpoon drew,	840
——— fourth do 14 lines; line broke,	3360
——— fifth do ½ line; harpoon drew,	120
——— sixth do 2½ lines, do do	600
——— seventh do 2½ lines, do do	600
——— eighth do 1 line, do do	240
Total in yards	10,440

† Charles Island, lying parallel to the west side of Spitzbergen, is usually denominated the Foreland; the middle Hook is a remarkable ridge of mountains near the middle of the Island.

were already considerably fatigued, having been employed immediately before in the arduous operation hereafter to be described, called *making off;* but, of course, proceeded in the boats to the chase of the fast fish. It made its appearance before they all had left the ship. Three boats then approached it, unluckily at the same moment. Each of them so incommoded the other, that no second harpoon could be struck. The fish then took the alarm and ran off towards the east, at the rate of about four miles per hour; some of the boats gave chase and others took hold of the fast-boat and were towed by it to windward. When two boats, by great exertions on the part of their crews, had got very near the fish, and the harpooners were expecting every moment to be able to strike it, it suddenly shifted its course under water, and in a few minutes discovered itself in a southerly direction, at least half a mile from any boat. It then completed a circuit round the fast-boat, with the sweep of nearly a mile as a radius, and though followed in its track by the boats, it dived before any of them got near it, and evaded them completely. When it appeared again, it was at least half a mile to windward of any of them, and then continued arduously advancing in the same direction. At various times during the pursuit, the boats having the most indefatigable crews, reached the fish within ten or fifteen yards, when, apparently aware of their design, it immediately sunk and changed its course; so that it in-

variably made its next appearance in a quarter where no boats were near.

The most general course of the whale being to windward, it soon withdrew all the boats many miles from the ship, notwithstanding our utmost efforts, under a press of sail to keep near them.

After six or seven hours pursuit without success, the sky became overcast, and we were suddenly enveloped for some time in the obscurity of a thick fog. In this interval the boats were all moored to the fast-boat, the men being fearful of being dispersed; but on the disappearing of the fog, the pursuit was recommenced with renewed vigour. Still the harpooners were not able to succeed. They were now convinced of the necessity of using every measure to retard the flight of the fish. For this purpose they slacked out nine lines, a weight in air of 11cwt., while the crew of the fast-boat endeavoured farther to retard its progress, by holding their oars firmly in the water, as if in the act of backing the boat astern. But this plan did not succeed. They then lashed two or three boats with their sides to the stern of the fast-boat, and these were dragged broadside first, with little diminished velocity for some time. But the fish at length feeling the impediment, suddenly changed its course, and again disappointed the people in two of the boats which had got extremely near it.

Several times the harpooners seized their weapons and were on the point of launching them at

the fish, when in an instant it shot from them with singular velocity and disappeared. In this way the chase was continued for fourteen hours, when the fish again turned to leeward. But the men, exhausted by such continued exertion, together with the hard labour to which they had been previously subjected, at the same time being without meat or drink, and sparingly sheltered from the inclemency of the weather by clothes drenched in oil, were incapacitated from taking advantage of the only chance they had ever had of success from the beginning of the chase.

By this time we had reached the boats with the ship. The wind had increased to a gale, and a considerable sea had arisen. We had no hope therefore of success. As however we could not possibly recover the lines at this time, stormy as the weather was, we applied a cask as a buoy to support them, and moored an empty boat having a jack flying in it, to the cask with the intention of keeping near it during the storm, and with the expectation of recovering our lines, and a faint hope likewise of gaining the fish after the termination of the gale. The boat was then abandoned. We made an attempt to keep near the boat with the ship, but the increasing force of the gale, drove us in spite of every effort to leeward. On the first cessation we made all sail, and plyed towards the boat; succeeded in finding it, recovered boat and line, but lost the whale.

On the 28th of May, 1817, the Royal Bounty, of Leith, Captain Drysdale, fell in with a great number of whales in the latitude of 77° 25′ N., and longitude 5° or 6° E. Neither ice nor land was in sight, nor was there supposed to be either the one or the other within 50 or 60 miles. A brisk breeze of wind prevailed, and the weather was clear. The boats were therefore manned and sent in pursuit. After a chase of about five hours, the harpooner commanding a boat, who, with another in company, had rowed out of sight of the ship, struck one of the whales. This was about 1 A. M. of the 29th. The captain supposing, from the long absence of the two most distant boats, that a fish had been struck, directed the course of the ship towards the place where he had last seen them, and about 8 A. M. he got sight of a boat which displayed the signal for being fast. Some time afterwards, he observed the other boat approach the fish, a second harpoon struck, and the usual signal displayed. As, however, the fish dragged the two boats away with considerable speed, it was mid-day before any assistance could reach them. Two more harpoons were then struck, but such was the vigour of the whale, that although it constantly dragged through the water from four to six boats, together with 1600 fathoms of line, which it had drawn out of the different boats, yet it pursued its flight nearly as fast as a boat could row; and such was the terror that it manifested on the approach of its enemies, that

whenever a boat passed beyond its tail, it invariably dived. All their endeavours to lance it, were therefore in vain. The crews of the loose boats, being unable to keep pace with the fish, caught hold of and moored themselves to the fast-boats, and for some hours afterwards, *all hands* were constrained to sit in idle impatience, waiting for some relaxation in the speed of the whale. Its most general course had hitherto been to windward, but a favourable change taking place, enabled the ship, which had previously been at a great distance, to join the boats at 8 P. M. They succeeded in taking one of the lines to the ship, which was made fast to the ship, with a view of retarding its flight. They then furled the top-gallant-sails, and lowered the top-sails; but after supporting the ship a few minutes head to wind, the wither of the harpoon *upset*, or twisted aside, and the instrument was disengaged from its grasp. The whale immediately set off to windward, with increased speed, and it required an interval of three hours before the ship could again approach it. Another line was then taken on board which immediately broke. A fifth harpoon had previously been struck, to replace the one which was pulled out, but the line attached to it was soon afterwards cut. They then instituted various schemes for arresting the speed of the fish, which occupied their close attention nearly twelve hours. But its velocity was yet such, that the master, who had himself proceeded to the attack, was unable to approach suffi-

ciently near to strike a harpoon. After a long chase, however, he succeeded in getting hold of one of the lines which the fish dragged after it, and of fastening another line to it. The fish then fortunately turned towards the ship, which was at a considerable distance to leeward. At 4 P. M. of the 30th, 36 hours after the fish was struck, the ship again joined the boats; when, by a successful manœuvre, they secured two of the fast-lines on board. The wind blowing a moderately brisk breeze, the top-gallant sails were taken in, the courses hauled up, and the top-sails clewed down; but notwithstanding the resistance a ship thus situated must necessarily offer, she was towed by the fish directly to windward, with the velocity of at least one and a half to two knots, during an hour and a half. And then, though the whale must have been greatly exhausted, it beat the water with its fins and tail in so tremendous a way, that the sea around was in a continual foam, and the most hardy of the sailors scarcely dared to approach it. At length, about 8 P. M., after 40 hours of almost incessant, and for the most part fruitless exertions, this formidable and astonishingly vigorous animal was killed. The capture and the flensing occupied 48 hours. The fish was 11 feet bone (the length of the longest laminæ of whalebone;) and its produce filled 47 butts, or 23½ ton casks with blubber.*

* This interesting occurrence was communicated to me

Excepting when it has young under its protection, the whale generally exhibits remarkable timidity of character. A bird perching on its back alarms it. The fisher, however, is sometimes liable to danger from its fury.

The Aimwell, while cruising in the Greenland seas, in the year 1810, had boats in chase of whales. One of them was harpooned. But instead of sinking immediately, on receiving the wound, as is the most usual manner of the whale, this individual only dived for a moment, and then rose again beneath the boat, struck it in the most vicious manner with its fins and tail, stove it, upset it, and then disappeared. The crew, seven in number, got on the bottom of the boat, but the unequal action of the line, which for some time remained entangled with the boat, rolled it occasionally over, and thus plunged the crew repeatedly into the water. Four of them, after each immersion, recovered themselves, and clung to the boat; but the other three, one of whom was the only person acquainted with the art of swimming, were drowned before assistance could arrive. The four men in the boat being rescued, the attack was renewed, and two more harpoons struck. But the whale, irritated instead of being enervated by its wounds, recommenced its furious

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by the *late* Captain of the Royal Bounty, in a letter containing the account of the transaction, as inserted in his log book.

conduct. The sea was in a foam. Its tail and fins were in awful play; and in a short time, harpoon after harpoon drew out; the fish was loosened from its entanglement, and escaped.

On the 3rd of June, 1811, a boat from the Resolution, commanded at the time by myself, put off in pursuit of a whale, and was rowed upon its back. At the moment that it was harpooned, it struck the side of the boat a violent blow with its tail, the shock of which threw the boat steerer to some distance into the water. A repetition of the blow, projected the harpooner and line manager in a similar way. One of the men regained the boat, but as the fish immediately sunk, and drew the boat away from the place, his two companions in misfortune were soon left far beyond the reach of assistance. The harpooner, though a practised swimmer, felt himself so bruised by a blow he had received on the chest, that he was totally incapacitated from giving the least support to his fellow sufferer. The ship being happily near, a boat arrived to their succour, at the moment when the line manager, who was unacquainted with the art of swimming, was on the point of sinking to rise no more. The fish, after a close pursuit, was subdued.

A large whale, harpooned from a boat belonging to the same ship, became the subject of a general chase. Being myself in the first boat which approached the fish, I struck my harpoon at arm's length, by which we fortunately evaded a blow

which appeared to be aimed at the boat. Another boat then advanced, and another harpoon was struck, but not with the same result, for the stroke was returned by a tremendous blow from the fish's tail. The boat was sunk by the shock, and at the same time whirled round with such velocity, that the boat steerer was precipitated into the water, on the side next the fish, and was accidentally carried down to a considerable depth by its tail. After a minute or two he arose, and was taken up, along with his companions, into my boat. A similar attack was made on the next boat which came up; but the harpooner, being warned of the prior conduct of the fish, used such precaution, that the blow, though equal in strength, took effect only in an inferior degree. The activity and skill of the lancers soon overcame this designing whale, and added its produce to the cargo of the ship. Such intentional mischief on the part of the whale, it must be observed, is a somewhat rare occurrence.

Proceedings after a Whale is Killed.

Before a whale can be flensed, as the operation of taking off the fat and whalebone is called, some preliminary measures are requisite. These consist in securing the fish to a boat, cutting away the attached whale-lines, lashing the fins of the whale together, and towing it to the ship.

The first operation performed on a dead whale, is to secure it to a boat This is easily effected, by

lashing it with a rope, passed several times through two holes pierced in the tail, to the boat's bow. The more difficult operation of freeing the whale from the entanglement of the lines, is then attempted. As the whale, when dead, always lies on its back, or on its side, the lines and harpoons are generally far under water. When they are seen passing obliquely downward, they are hooked with a grapnel, pulled to the surface and cut. But when they hang perpendicularly, or when they can not be seen, they are discovered by a process, called "sweeping a fish."

While this is in progress, the men of the other boats, having first lashed the tail to a boat, are employed in lashing the fins together across the belly of the whale. I have observed two or three curious circumstances connected with these operations, which I shall venture to mention.

On one occasion, I was myself engaged in the capture of a fish, upon which, when to appearance dead, I leaped, cut holes in the fins, and was in the act of reeving a rope through them, when the fish sunk beneath my feet. As soon as I observed that the water had risen above my knees, I made a spring towards a boat at the distance of three or four yards from me, and caught hold of the gunwale. Scarcely was I on board before the fish began to move forward, turned from its back upon its belly, reared its tail aloft, and began to shake it with such prodigious violence, that it resounded through the

air to the distance of two or three miles. After two or three minutes of this violent exercise, it ceased, rolled over upon its side, and died.

In the year 1816, a fish was to all appearance killed. The fins were partly lashed, and the tail on the point of being secured, and all the lines excepting one were cut away, the fish meanwhile lying as if dead. To the astonishment and alarm, however, of the sailors, it revived, began to move, and pressed forward in a convulsive agitation; soon after, it sunk in the water to some depth, and then died. One line remained attached to it, by which it was drawn up and secured. A fish being properly secured, is then "taken in tow," that is, all the boats join themselves in a line, by ropes always carried for the purpose, and unite their efforts in rowing towards the ship. The course of the ship, in the mean time, is directed towards the boats, but in calms, or when the ship is moored to the ice, at no great distance, or when the situation of the fish is inconvenient or inaccessible, the ship awaits the approach of the fish.

The fish having reached the ship, is taken to the *larboard* side, arranged and secured for flensing. For the performance of this operation, a variety of knifes and other instruments is requisite.

Towards the stern of the ship, the head of the fish is directed; and the tail, which is first cut off, sent abreast of the fore chains. The smallest or posterior part of the whale's body, where the

tail is united, is called the rump, and the extremity or anterior part of the head is drawn in an opposite direction by means of the nose tackles. Hence, the body of the fish is forcibly extended. The right-side fin, being next the ship, is lashed upward towards the gunnel. A band of blubber, two or three feet in width, encircling a fish's body, and lying between the fins and the head, being the fat of the neck, or what corresponds to the neck in other animals, is called the *kent*, because by means of it the fish is turned over or *kented*. In the commencement of this band of fat or kent is fixed the lower extremity of a combination of powerful blocks, called the *kent purchase*. Its upper extremity is fixed round the head of the main mast, and its *fall* or rope, is applied to the windlass, drawn tight, and the upper surface of the fish rising several inches above the water. The enormous weight of a whale prevents the possibility of raising it more than one fourth, or one fifth part out of the water, except, indeed, when it has been some days dead, in which case it swells in consequence of air generated by putrefaction, until one third of its bulk, appears above the surface; the fish then lying belly upwards, extended and well secured, is ready for the operation of flensing.

Process of Flensing.

After the whale is properly secured along side of the ship, the harpooners, having their feet armed

with spurs, to prevent them from slipping, descend upon the fish. Two boats, each of which is under the guidance of one or two boys, attend upon them, and serve to hold all their knives, and other apparatus. Thus provided, the harpooners, directed by the specksioner,* divide the fat into oblong pieces, or "slips," by means of "blubber spades" and "blubber knives;" then, affixing a "speck-tackle" to each slip, flay it progressively off, as it is drawn upwards. The speck-tackles, which are two or three in number, are rendered effective by capstern winches, or other mechanical powers. The flensers commence with the belly and under jaw, being the only part then above water. The blubber, in pieces of half a ton each, is received on deck, and divided into portable, cubical, or oblong pieces, containing near a solid foot of fat, and passed down between decks, when it is packed in a receptacle provided for it in the hold, or other suitable place, called the flens-gut, where it remains until further convenience.

All the fat being taken away from the belly, and the right fin removed, the fish is then turned round on its side by means of the kent, which, by the power of the windlass, readily performs this office.

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* The name of this officer was introduced by the Dutch, and is derived from the word *speck*, which, in their language, is applied to the fat of the whale, as well as to that of other animals.

The upper surface of fat is again removed, together with the left fin, and after a second kenting, one of the "lips" is taken away, by which the whalebone of one side of the head, now lying nearly horizontal, is exposed. The fish being a little further turned, the whalebone of the left side is dislodged by the use of "bone hand-spikes," "bone knives," and "bone spades." These constitute what are called "bone geer," and are used, with the assistance of speck tackles, for taking up the whalebone in one mass. On its arrival on deck, it is split with bone wedges into "junks," containing five to ten blades each, and stowed away. A further kenting brings the fish's back upward, and the next exposes the second side of bone. As the fish is turned round, every part of the blubber becomes successively uppermost and is removed. At length, when the whole of the blubber, whalebone, and jaw bones have been taken on board, the kent, which now appears a slip of perhaps 30 feet in length, is also separated, together with the rump rope, and nose tackle, on which, the carcass being at liberty, generally sinks in the water and disappears.

When sharks are present, they generally help themselves very plentifully, during the progress of the flensing; but they often pay for their temerity with their lives. Fulmars pay close attendance in immense numbers. They seize the fragments occasionally disengaged by the knife, while they are swimming in the water; but most of the other

gulls, who attend on the occasion, take their share on the wing. The burgomaster is decidedly master of the feast. Hence every bird is obliged to relinquish the most delicious morsel, when the burgomaster descends to claim it.

When despatch is seconded by ability, the operation of flensing can be performed on a whale, affording 20 or 30 tons of blubber, in the space of three or four hours. Flensing in a swell is a most difficult and dangerous undertaking, and when the swell is considerable, it is commonly impracticable. No ropes or blocks are capable of bearing the jerk of the sea. The harpooners are annoyed by the surge, and repeatedly drenched in water, and are likewise subject to be wounded by the breaking of ropes, or hooks, or tackles, and even by strokes from each other's knives. Hence, accidents in this kind of flensing are not uncommon. The harpooners not unfrequently fall into the fish's mouth, when it is exposed by the removal of a surface of blubber; where they might easily be drowned, but for prompt assistance.

Some years ago, I was witness of a circumstance in which a harpooner was exposed to the most imminent risk of his life at the conclusion of a flensing process, by a very curious accident. The harpooner stood on one of the jaw bones of the fish, with a boat by his side. In this situation, while he was in the act of cutting the kreng* adrift, a boy inadvertently

* The carcass, after being flensed, is so called.

stuck the point of the boat-hook, by which he usually held the boat, through the ring of the harpooner's spur, and in the same act, seized the jaw bone of the fish with the hook of the same instrument. Before this was discovered, the kreng was set at liberty, and began instantly to sink. The harpooner then threw himself towards the boat, but being firmly entangled by the foot, he fell into the water. Providentially he caught the gunwale of the boat with both hands; but overpowered by the force of the sinking kreng, he was on the point of relinquishing his grasp, when some of his companions got hold of his hands while others threw a rope round his body. The carcass of the fish was now suspended entirely by his body, which was consequently so dreadfully extended, that there was some danger of his being drawn asunder. But such was his terror of being taken under water, that notwithstanding the excruciating pain he suffered, he constantly cried to his companions, to "haul away the rope." He remained in this dreadful state until means were adopted for hooking the krong with a grapnel, and drawing it back to the surface of the water.

Process of Making Oil.

When a fish is caught, or sometimes when there is a good prospect of success in the fishery, even before a fish is caught, the centre of the ship's hold is disencumbered of a few of its casks, to be in

readiness for the reception of the blubber. The cavity thus made, together with all the space between decks which can conveniently be appropriated to the same purpose, receives the name of the *flens-gut*. Now, when the flens-gut is filled with blubber, or when, no fish having been seen, a favourable opportunity of leisure is presented, the operation of *making off** is generally commenced. This consists of freeing the fat from all extraneous substances, especially the muscular parts, and the skin; then cutting it into small pieces, and putting it into casks through the bunghole. Before the process of making off can, however, be commenced, several preparatory measures are necessary. The ship must be moored to a convenient piece of ice, or placed in an open situation, and the sails so reduced as to require no further attention in the event of bad weather occurring. The hold of the ship must be cleared of its superstructure of casks, until the "ground tier," or lowest stratum of casks, is exposed; and the ballast water must be "started," or pumped out of all the casks that are removed upon deck, as well as out of those in the ground tier, which are first prepared for the reception of the blubber. In "breaking out the hold," it is

* The expression "making off," seems to be derived from the word *afmaaken* of the Dutch, signifying to finish, adjust, or complete, referring to the nature of the operation, as a concluding, finishing, or adjusting process.

not necessary to lay open more of the ground tier at a time, than three or four casks extended in length.

The water which is discharged from the casks in the hold, provided they have been before in use, gives out a great quantity of a strong disagreeable vapour, consisting probably of sulphuretted and phosphuretted hydrogen, with a mixture of other gaseous fluids, produced by the decomposition of the oleaginous, and other animal substances, left in the casks after former voyages. This decomposition seems to be encouraged, if not wholly produced, by the action of the water on the animal matter; because the same casks, if bunged close, when empty, give out but a small quantity of gas and that of inferior pungency. The gas proceeding from oily casks, having contained water, resembles, in some degree, though vastly more pungent, the gas evolved by "bilge water," or the stagnant water which rests among the timbers of a very tight ship. The gas discharged from oily casks, is usually stronger and more abundant, in proportion as the water from which it is disengaged, has been a longer time in the casks. A considerable quantity of it is generated in the space of three or four months. This gas blackens metals, even gold, restores some metallic oxides, is disagreeable in respiration, and affects the eyes of the persons employed in the hold, where it is most abundant, so as to occasion ophthalmic inflammation, and frequently temporary blindness.

While the line-managers, together with the "skeeman,"* the cooper, and perhaps a few others, are employed in breaking out the hold, the rest of the crew on the deck arrange all the variety of apparatus used for the preparation of the blubber, before it is put into the casks. Of this apparatus, the most considerable part is the "speck-trough," with its appendages. It consists of a kind of oblong box or chest, about twelve feet in length, $1\frac{3}{4}$ feet in breadth, and $1\frac{1}{2}$ feet in depth. The speck-trough is fixed upon the deck, as nearly as possible over the place where the casks are to be filled in the hold. A square hole, made in its bottom, is placed either over the nearest hatch-way to the scene of operation, or upon a corresponding hole cut in the deck.

The speck-trough is then secured, and its lid turned backward into a horizontal position; in which position it is supported on one side by its hinges, and on the other by screw props or pillars; or it is altogether rested upon several little stools. The surface of the lid, which thus placed, forms a level table, is then covered with blocks of whales' tail, from end to end. This substance, from its sinewy and elastic nature, makes excellent "chopping blocks," and preserves the "chopping knives" from injury, when used for dividing the blubber

* The officer who has the direction of operations conducting in the hold.

upon it. Into the square hole in the bottom of the speck-trough is fitted an iron-frame, to which is suspended a canvass tube or "hose," denominated a *lull*. The lull is open at both ends. Its diameter is about a foot, and its length sufficient to reach from the deck to the bottom of the hold. To the middle, or towards the upper part of the lull, is attached a "pair of nippers," consisting of two sticks fastened together by a kind of hinge at one end, and capable of being pressed together at the other. The nippers being passed across the body of the lull, and their detached extremities brought together, they embrace it so closely, that nothing can pass downward while they remain in this position; but when, on the other hand, the nippers are extended, the lull forms a free channel of communication between the speck-trough and the hold.

Every thing being now in readiness, the blubber, as it is thrown out of the flens-gut, undergoes the following several operations. It is received upon deck by the "krengers," whose office is to remove all the muscular parts, together with such spongy or fibrous fat, as is known by experience to produce very little oil. When these substances, which go under the general denomination of kreng, are included among the blubber in the casks, they undergo a kind of fermentation, and generates such a quantity of gas, as sometimes to burst the containing vessels, and occasion the loss of their contents. From the krengers, the blubber

passes to the harpooners. Each of these officers, provided with a blubber-knife, or a strand knife, places himself by the side of a "closh," which is an upright fixed in the deck, from the top whereof, project several sharp spikes. An attendant, by means of a pair of "hand hooks," or a "pick haak," then mounts a piece of blubber upon the spikes of the closh, and the harpooner slices off the skin. From the skinners, the blubber is passed into an open space called the bank, prepared as a depositary, in front of the speck-trough and it is then laid upon the "chopping blocks," as wanted. It now falls under the hands of the boat steerers, who armed with "chopping knives," are arranged in a line by the side of the chopping-blocks, with the speck-trough before them. Thus prepared, they divide the blubber, as it is placed on their blocks, into oblong pieces, not exceeding four inches in diameter, and push it into the speck-trough intended for its reception. And, finally, the blubber falls under the direction of the line managers, stationed in the hold, who receive it into tubs, through the medium of the lull; and pass it, without any instrument but their hands, into the casks through their bung-holes. The casks being closely filled, are then securely bunged up.

When the ground tier casks, as far as they have been exposed, are filled, the second tier of casks is "stowed" upon it, and likewise filled with blubber, together with the third tier casks when necessary. As in this progressive manner, when fish can be

had in sufficiency, all the hold is filled, and likewise the space between decks,—it is evident, that the process of making-off must be tedious, disagreeable and laborious. Fifty men, actively employed, can prepare and pack about three tons of blubber in an hour; though, more frequently, they are contented with making-off little more than half that quantity.*

When a ship, which makes a successful fishing, is deficient in casks, the remaining vacancies adapted for the reception of the cargo, are filled with "blubber in bulk," that is, the blubber, in large pieces as it is taken off the whales, is laid skin downward, upon the highest tier of casks, and over this, stratum after stratum, until the vacancies are filled. A little salt is usually scattered over the surface of each stratum of blubber, which assists in preserving the animal fibre, and in preventing the discharge of the oil. Blubber in bulk, notwithstanding every precaution, however, generally loses much of its oil.

A quick passage homeward, with cool weather and smooth sea, are favourable for its preservation,

* The operation of making-off was always, in the earlier ages of the fishery, performed on shore; and even so recently as the middle of last century, it was customary for ships to proceed into a harbour, and there remain so long as this process was going on.

but under the influence of opposite circumstances, it becomes greatly reduced.

Process of boiling Blubber, or extracting Oil.

The blubber, which is originally in the state of firm fat, is found, on arrival in a warm climate, to be in a great measure resolved into oil. The casks containing the blubber are conveyed by a mechanical apparatus to the top of a wooden cistern, called the *starting-back*, capable of containing from 3 to 6 or 10 tons, into which their contents are started through the bung-holes. When the copper or boiler, which is a vessel of about the same capacity as the starting-back, is properly cleansed, the contents of the starting-back, on lifting a clough at the extremity, or turning a stop-cock, fall directly into the copper, one edge of which is usually placed beneath. The copper is filled within two or three inches of the top, a little space being requisite to admit of the expansion of the oil when heated; and then a brisk fire is applied in the furnace, and continues until the oil begins to boil. This usually takes place in less than two hours. Many of the fritters or fenks (the refuse) float on the surface of the oil before it is heated, but after it is boiled off, the whole, or nearly so, subside to the bottom. From the time the copper begins to warm, until it is boiled off, or ceases to boil, its contents must be incessantly stirred by means of a pole armed with a

kind of broad blunt chisel, to prevent the fenks from adhering to the bottom or sides of the vessel. When once the contents of the copper boil, the fire in the furnace is immediately reduced, and shortly afterwards altogether withdrawn. Some persons allow the copper to boil an hour, others during two or three hours. The former practice is supposed to produce finer or paler oil, the latter a greater quantity. Supposing the copper to be filled at four in the morning, it is generally brought to boil by half past five, and boiled off at half past six or seven. It then stands to cool or subside, until about two in the afternoon, when the bailing process commences. A back or cooler having been prepared for the reception of the oil, by putting into it a quantity of water,* for the double purpose of preventing the heat of the oil from warping or rending the back, and for receiving any impurities which it may happen to hold in suspension; a wooden spout, with a large square box-like head, which head is filled with brush-wood or broom, that it may act as a filter, is then placed along, from the "copper-head"† to the cooler, so as to form a communication between the two. The oil in the copper being now separated from the fenks, water, and other impuri-

* Some persons dispense with the water, believing that it promotes rancidity in the oil.

† The platform built around the edge of the copper, is called the *copper-head.*

ties, all of which have subsided to the bottom, is, in a great measure, run off through the pipe communicating with the cooler, and the remainder is carefully lifted in copper or tin ladles, and poured upon the broom in the spout, from whence it runs into the same cooler, or any other cooler, at the pleasure of the "boilers."* Besides oil and fenks, the blubber of the whale likewise affords a considerable quantity of watery liquor, produced probably from the putrescence of the blood, on the surface of which, some of the fenks, and all the greasy animal matter called *footje* or *footing*, float, and upon the top of these the oil. Great care, therefore, is requisite, on approaching these impure substances, to take the oil off by means of shallow tinned iron or copper ladles, called *skimmers*, without disturbing the refuse, and mixing it with the oil. There must always, however, be a small quantity towards the conclusion, which is a mixture of oil and footing; such is put into a cask or other suitable vessels by itself, and when the greasy part has thoroughly subsided, the most pure part is skimmed off, and becomes fine oil, and the impure is allowed to accumulate by itself in another vessel, where, in the end, it affords "brown oil."

The refuse now left in the copper, is *bailed* into

* The men employed in extracting oil are thus denominated.

a tunnel or spout, which conveys it into the fenk-back, where it remains as long as the capacity of the vessel will admit; a portion of brown oil, which is constantly found rising to the surface, being, in the meantime, occasionally skimmed off.

A few years ago, my father instituted a process for reducing blubber into oil, by the use of steam; and a similar process has been adopted in Hull, and other ports, and applied to the extraction of oil, with considerable advantage.

From a ton, or 252 gallons by measure, of blubber, there generally arises from 50 to 65 gallons of refuse, whereof the greater part is a watery fluid. The constant presence of this fluid, which boils at a much lower temperature than the oil, prevents the oil itself from boiling, which is, probably an advantage, since, in the event of the oil being boiled, some of the finest and most inflammable part, would fly off in the form of vapour; whereas, the principal part of the steam, which now escapes, is produced from the water.

Some persons make a practice of adding a quantity of water, amounting, perhaps, to half a ton, to the contents of each copper, with the view of weakening or attenuating the viscid impurities contained in the blubber, and thus obtaining a finer oil; others consider the quantity of watery fluid, already in the blubber, as sufficient for producing every needful effect.

Each day, immediately after the copper is emptied, and while it is yet hot, the men employed in

the manufacture of the oil, having their feet defended by strong leathern or wooden shoes, descend into it, and scour it out with sand and water, until they restore the natural surface of the copper, wherever it is discoloured. This serves to preserve the oil from becoming high coloured,* which will always be the case, when proper cleanliness is not observed.

The starting-back being previously filled with blubber, its contents are again transferred into the copper, and the fire is applied as before. This is generally accomplished by four, or half past four o'clock in the afternoon. The copper again boils by half an hour after five or six, and is boiled off by seven or eight in the evening. The men employed in this service, consisting of about six persons, alternately watch in the night by couples. Those on watch, commence about two in the morning to empty the copper, which done, they again fill it from the starting-back, which is always made ready the night before. Thus the process goes on, until the whole cargo is finished.

By means of three coolers, severally capable of containing at least twice the quantity of oil produc-

* The palest coloured oil is most esteemed by buyers, and is supposed to be the best; simply, perhaps, because it seems to have been manufactured with care, and appears to be free from any admixture of brown or black oil, produced from the fenk-back, or found in the hold of the ship.

ed from one boiling of blubber in the copper, each can be allowed, in turn, to stand undisturbed upwards of twenty-four hours. Thus, while one is in the act of being filled, the other stands to cool and settle, and the third is drawn off. If the backs be twice this size, or four times the capacity of the copper, every one will require two days to be filled by one copper, and after being filled, may subside during two or three days undisturbed. Even two backs in number, of this capacity, would admit of an interval of twenty four hours each, after being filled, before it would be necessary to begin to empty it. Thus prepared and cooled, the oil is in a marketable state, and requires only to be transferred from the coolers into casks for convenience of conveyance to any part of the country. Each of the coolers, it has been observed, is furnished with a stop-cock, beneath which there is a platform adapted for receiving the casks, when they are filled, with great ease, by the introduction of a leathern tube, extending from the orifice of the stop-cock into the bung-hole.

At the conclusion of the process of boiling, each vessel's cargo manufactured on the premises, the backs are completely emptied of their contents. To effect this, water is poured in, until the lower part of the stratum of oil rises to within a few lines of the level of the stop-cock, and permits the greater part of the oil to escape. The quantity left, amounts, perhaps, to half an inch, or an inch in depth. To

recover this oil without waste requires a little address. A deal-board, in length a little exceeding the breadth of the cooler, is introduced at one end, a little diagonally, and placed edgewise in its contents. The ends of the board being covered with flannel, when pressed forcibly against the two opposite sides of the cooler, prevent the oil from circulating past. The board is then advanced slowly forward, towards the part of the back, where the stop-cock is placed; and in its progress, (the ends being kept close to the side of the cooler, and the upper edge a little above the surface of the oil,) all the oil is now collected by the board, while the water has a free circulation beneath it. When the oil accumulates to the depth of the board, its further motion is suspended, until the oil, thus collected, is drawn off. Another similar board is afterwards introduced at the farthest extremity of the cooler, and passed forward in the same manner, whereby the little oil which escapes the first is collected. Now the remnant, which still refuses to run off by the orifice of the stop-cock, being collected in a corner, is taken up by *skimmers;* and the footing or sediment which appears at the last, is disposed of in the same way as the footing from the copper, until the oil it contains rises to the surface and can be removed.

In most of the out-ports, the oil is generally deposited in casks, in which it remains until it is disposed of by the importers. In London, however,

and in some concerns in Hull and other ports, the speculators in the whale fishery are provided with cisterns or tanks, wherein they can deposit their oil, and preserve it until a convenient time for selling, without being subject to the waste which usually takes place when it is put into casks. From these cisterns, any quantity can be drawn off at pleasure.

The smell of oil, during its extraction, is undoubtedly disagreeable; but, perhaps, not more so than the vapour arising from any other substance submitted to the action of heat when in a putrid state. The prevailing opinion, however, that a whale ship must always give out the same unpleasant smell, is quite erroneous. The fact is, that the fat of the whale, in its fresh state, has no offensive flavour whatever, and never becomes disagreeable until it is brought into a warm climate and becomes putrid; neither is a whale ship more unpleasant than any other trader, until after her cargo is opened on her arrival in port.

Description of Whalebone, and the Method of Preparing it.

Whalebone, or whale fins, as the substance is sometimes, though incorrectly named, is found in the mouth of the common Greenland whale, to which it serves as a substitute for teeth. It forms an apparatus most admirably adapted, as a filter, for se-

parating the minute animals, on which the whale feeds, from the sea water in which they exist.

It is a substance of a horny appearance and consistence, extremely flexible and elastic, generally of a bluish black colour, but not unfrequently striped longitudinally with white, and exhibiting a beautiful play of colour on the surface. Internally it is of a fibrous texture, resembling hair; and the external surface consists of a smooth enamel, capable of receiving a good polish.

This substance, when taken from the whale, consists of laminæ, connected by what is called the gum, in a parallel series, and ranged along each side of the mouth of the animal. The laminæ are about 300 in number, in each side of the head. The length of the longest blade, which occurs near the middle of the series, is the criterion fixed on by the fishers, for designating the size of the fish. Its greatest length is about 15 feet; but an instance very rarely occurs of any being met with above 12½ or 13 feet. Its greatest breadth, which is at the root end, is 10 or 12 inches, and its greatest thickness four-tenths or five-tenths of an inch.

The two *sides* or series of the whalebone, are connected at the upper part of the head, or crown bone of the fish, within a few inches of each other, from whence they hang downward, diverging so far as to enclose the tongue between their extremities; the position of the blades, with regard to each other, resembles a frame of saws in a saw mill; and taken

altogether, they exhibit, in some measure, the form and position of the roof of a house. The smaller extremity and interior edge of each blade of bone, or the edge annexed to the tongue, are covered with a long fringe of hair, consisting of a similar kind of substance as that constituting the exterior of the bone. Whalebone is generally brought from Greenland in the same state as when taken from the fish, after being divided into portable *junks*, or pieces, comprising ten or twelve laminæ in each; but occasionally it is subdivided into separate blades, and the gum and hair removed when at sea.

One of the first importations of whalebone into England, was probably in the year 1594, when a quantity of this substance, being part of the cargo of a wrecked Biscayan ship, was picked up at Cape Breton, by some English ships, fitted out for the whale and morse fisheries, after the example of the Icelanders and Biscayans.*

This substance has been held in such high estimation, that, since the establishment of the Spitzbergen whale fishery, the British have occasionally purchased it of the Dutch, at the rate of 700*l.* per ton.† It is calculated, that at least 100,000*l.* *per annum* were paid to the Dutch for this article, about the years 1715 to 1721, when the price was 400*l.*‡

* Hakluyt's Voyages, vol. iii. p. 194.

† Macpherson's Annals of Commerce, vol. iii. p. 513.

‡ Elking's View of the Greenland Trade, &c. p. 65.

About the year 1763, the price in England was 500*l.* *per* ton; but after an extensive importation of this article from New England, the price delined to 350*l.** and subsequently as low as 50*l.* *per* ton. Of late years the price has usually been fluctuating between 50*l.* and 150*l.* *per* ton. Whalebone becomes more valuable as it increases in length and thickness.

On or near the premises where the oil is extracted, the whalebone is commonly cleaned and prepared.

The first operation, if not already done, consists in depriving it of the gum. It is then put into a cistern containing water, until the dirt upon its surface becomes soft. When this effect is sufficiently produced, it is taken out, piece by piece, laid on a plank placed on the ground, where the operator stands, and scrubbed or scoured with sand and water, by means of a broom or a piece of cloth. It is then passed to another person, who, on a plank or bench, elevated to a convenient height, scrapes the root-end where the gum was attached, until he produces a smooth surface; he or another workman, then applies a knife or a pair of shears to the edge, and completely detaches all the fringe of hair connected with it. Another person, who is generally the superintendent of the concern, afterwards re-

* Macpherson's Annals, vol. iii. p. 371.

ceives it, washes it in a vessel of clean water, and removes, with a bit of wood, the impurities out of the cavity of the root. Thus cleansed, it is exposed to the air and sun until thoroughly dry, when it is removed into a warehouse, or other place of safety and shelter.

Before it is offered for sale, it it usually scrubbed with brushes and hair-cloth, by which the surface receives a polish, and all dirt or dust adhering to it is removed; and finally, it is packed in portable bundles, consisting of about a hundred weight each. The *size*-bone, or such pieces as measure six feet or upward in length, is kept separate from the *under-size;* the latter being usually sold at half the price of the former. Each blade being terminated with a quantity of hair, there is sometimes a difficulty in deciding, whether some blades of whalebone are size or not. Owing to the diminished value of under-size bone, and more particularly, in consequence of the captain and some of the officers engaged in a fishing ship, having a premium on every size fish, it becomes a matter of some importance in a doubtful case, to decide this point. From a decision, which I understand has been made in a court of law, it is now a generally received rule, that so much of the substance terminating each blade, as gives rise to two or more hairs, is whalebone: though, in fact, the hair itself is actually the same substance as that of which the whalebone is composed.

APPENDIX.

A.

The Common Wild Cat; or Bay Lynx.

Felis Rufa, Guld. Penn. &c.

(See vol. 1. plate opposite page 203, fig. 2.)

It is highly probable that all the species of wild cat described under the names of *Fasciata, aurea,* Montana, &c., may be correctly referred to the present, which is the only species, (in addition to the *Felis canadensis* Geoff. Borealis; Temm.) of whose existence in this country, sufficiently satisfactory evidence is to be obtained. At least we have not been able to find any other in the cabinets of natural history to which we have had access, nor in the caravans of living American animals, frequently exhibited within our vicinity. The naturalists attached to the different exploring parties which have traversed vast extents of the American territory, have not been able, by their own efforts, nor through the aid of the Indians, to procure any species but the common wild-cat: we therefore deem it most

correct to wait for additional observations, before we admit the existence of so many species as have been proposed.

The common wild-cat stands very high upon its legs, and has a short tail, which is curved upwards at its extremity; which circumstances tend to give the animal an appearance of being somewhat disproportioned. In other respects, its physiognomy reminds one strongly of the domestic cat, to which its general aspect and movements are very similar. The residence of the wild-cat, is usually in wooded districts, where it preys upon birds, squirrels, and other small animals, which are taken by surprise, according to the manner of all the animals belonging to the genus Felis.

The common wild-cat is about two feet long, and twelve or thirteen inches in circumference. The tail but little surpasses three inches in length.

The general colour of the pelage, is a deep reddish, mingled with small spots of blackish brown; the inferior parts of the body and throat, as well as the inferior surface of the tail are white, or whitish. Numerous small, nearly vertical streaks of black, are to be observed on the front between the ears, and down to the space surrounding the orbits, which are encircled by a clear pale, red, or whitish fur. There are small pencils of hairs to the tips of the ears.

B.

We believe the observation was first made by MITCHILL, that the opossum, *Didelphis Virginiana*, is never found to inhabit the country north of the Hudson, and we have been informed by a scientific friend, who has devoted an especial degree of attention to the subject, that from repeated researches and inquiries, he is satisfied that the observation of our distinguished countryman above named, is correct. This fact appears the more singular, when it is remembered, that numbers of the species are found along the southern banks of the river, and it is well known, that in other parts of the country, rivers of nearly equal size offer no barrier to the diffusion of this species. It is a curious and interesting inquiry to determine the causes of this limitation; in the present state of our knowledge, we have no satisfactory explanation to offer.

In relation to the generation of the opossum, considering that this work is destined for general readers, we have deemed it advisable to omit what we have prepared on this subject, and to make the facts we have been enabled to collect and observe, the subject of a paper to be published in a work exclusively devoted to students of natural science.

D.

Wistar's Fossil Elk.

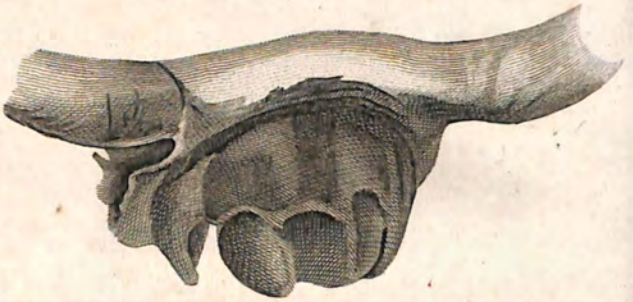
(Vol. 2. fig. * and † in plate opposite page 197.)

The late distinguished professor WISTAR published an account of some fossil skulls, (exhumed at Big-Bone Lick, Kentucky, by Gen. Clark, one of the enterprising explorers of the western regions,) which were presented to the American Philosophical Society, by JEFFERSON. Among other descriptions, is the following of the head of one of the largest species of the genus Cervus.

The breadth of the skull, at its narrowest part, is 4.75 inches. The depth, from the margin of the occipital surface to the most distant part of the great foramen of the occipital bone, is 5.25 inches. From the superior surface, immediately posterior to the base of the horns, to the body of the sphenoid bone, immediately under it, 4.7 inches. The length of the cranium, from the centre of the space between the horns, to the projection of the occipital bone, is 6.37 inches.

Dr. WISTAR compared this skull with that of the American Elk, *Cervus Caradensis*, and the Rein-Deer *C. Tarandus*, and concluded, that it more nearly resembled the Elk, at the occiput, though differing from it greatly in the position and protection of the horns. According to the measurements and comparisons of Dr. Wistar, this Elk

Wistar's Fossil Ox



Common Ox.

Bison.

must have been much larger than either the American Elk, or the Rein-Deer. The species is doubtless entirely extinct.*

The name of "*Americanus*" has been given to this species.

F.

Wistar's Fossil Ox.

In the paper above referred to, Dr. Wistar described the fossil skull of an ox, obtained from the same locality, which he considered as nearly allied to the Bison, Bos Americanus. The most remarkable peculiarity of this skull, is the projection or convexity of that portion of the facial or frontal surface between the horns. The accompanying plate gives a front and back view of this skull. The species has been named "*Bombifrons.*"

Great Fossil Ox.

The portion of the skull, and nucleus of the horn, belonging to the valuable cabinet of the American

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* See American Philosophical Trans. vol. 1. new series, p. 377. In the figures we have transferred from Wistar's plate, the posterior and superior view of the skull is marked with a *; the profile view with a †.

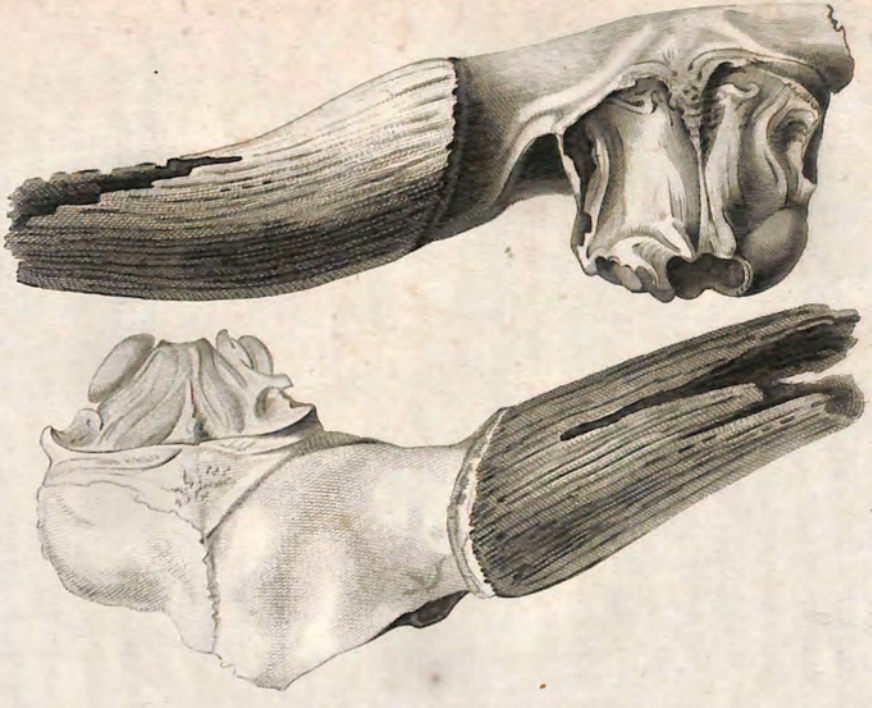
Philosophical Society, from which specimen, the annexed accurate drawing was made by M. Le Sueur, was first described and figured in the annals of the museum, by Cuvier, and subsequently in his great work on Fossil Bones. The drawing renders any detailed description unnecessary. The nucleus of the horn, measures twenty-eight inches in circumference. Though nothing but the fragment here represented is preserved, there can be no doubt but that the animal was of great size and belonged to a species which is utterly extinct. The species has been named "*Catifrons.*"

Dekay's Fossil Ox.

We must refer the reader to the 2d vol. of the Annals of the Lyceum of New York, for the full description of the fragments of this skull, and the comparisons instituted by Dr. Dekay to determine the species.

Dr. Dekay considers that none of the Genus Bos, now to be found in this country, have crania in the slightest degree resembling this specimen. It was thrown out at the eruption caused by an earthquake in 1812, which entirely destroyed the town of New Madrid, on the Mississippi.

Dr. Dekay proposes to designate the species of Fossil crania to which he refers those of Pallas and Ozeretskovsky, by the name of Bos Pallasii, and the



Great Fossil Ox

New Madrid fragment he refers provisionally to the same.

Mitchill's Fossil Walrus.

Dr. Mitchill has received from the shores of Long Island, a very interesting skull belonging to a species of the genus *Trichecus*. This skull is agatised and in a fine state of preservation. It has been referred to the examination of a committee of the Lyceum, and their report will be found in the 2d volume of the annals of that excellent Institution.

CONCLUSION.

This work has been delayed by uncontrollable circumstances, for a much longer period than was anticipated. It is not now the time to offer any apology for the manner in which the undertaking has been accomplished. In reviewing what we have done, it is easy to perceive that much may be hereafter improved. These, and all other deficiencies will no doubt be indicated by those who interest themselves in the execution of such performances. We shall certainly profit by their suggestions, whether made in a spirit of candour or malevolence.

We have been as *original* as it was possible to be, in such a work, unless the whole business of the author's life, had been the collection of materials. The observations we have had an opportunity of making from living nature, we fear not to have compared with those made by any other individual. Wherever we have been obliged to compile, we have anxiously endeavoured to approximate the truth, and have faithfully acknowledged the aid obtained from different sources.

It has been our intention to render this study pleasing and intelligible, more than to discuss minutia of classification; to give the *Natural History*, instead of the nomenclature of American animals; to impart information to those seeking for knowledge, rather than to prepare a book for such as consider themselves the founders of systems and settlers of moot points in philosophy. If we have accomplished nothing more, we have rendered it much easier for our successors to attempt the composition of a better work, having saved them the toil of examining a vast number of books, to glean the detached observations worthy of being brought together.

"Reader, I have given thee an Account of my "intendments and endeavours in this Performance; "and if it hath, (as I am too conscious to myself, it "often hath,) happened, that I have any where fail-"ed of my design; if in a long and tedious Work, "I have, thro' inadvertency, streights of time, and "hurry sometimes of other business, made any balk, "and committed mistakes, let thy humanity excuse "the humane infirmities of Thine, and his Coun-"try's Faithful Servant,"

JOHN D. GODMAN.

GENERAL SYNOPSIS OF MAMMALIA

INHABITING NORTH AMERICA.

BY CHARLES L. BONAPARTE.

Mammalia are vertebrated, warm blooded, viviparous animals; suckling their young; breathing by lungs which float freely in the chest, imperforated; the heart is bilocular and biauricular.

In the present state of science, they form the first class of the first type of the animal kingdom.

GENERAL DIVISIONS,

Or, view of the natural families of the system, adopted in classifying the North American Mammalia.

Sub-class 1. Quadrupeda.

Limbs four, obvious: head separated from the body by the intervention of a neck.

Section I.

Unguiculata; nails covering only the tips of the digits.

§ Three kinds of teeth.

ORDER I. Primates.

Mammæ 2, pectoral: penis free: anterior limbs terminated by hands.

Tribe I. Bimana.

Family 1. Bimana. Anterior limbs only, terminated by hands: body vertical, plantigrade.

Tribe II. Quadrumana.

The four limbs terminated by hands.

Family 2. Simiæ. Resembling man; 4 incisive teeth in each jaw.

Family 3. Lemurini. Resembling carnivorous animals; incisors varying in number, shape and situation; nostrils at the tip of the snout.

Family 4. Dermoptera. Digits of the anterior limbs moderate, robust, all furnished with compressed incurved nails; connecting membrane pilous.

ORDER II. Cheiroptera.

Mammæ 2, pectoral; penis free: limbs connected by a membrane formed for flying.

Family 5. Cheiroptera. Digits of the anterior limbs excessively elongated, comprised in an expansion of the naked membrane of the flanks, thumb free, but not opposable.

ORDER III. Feræ.

Mammæ abdominal, numerous; penis attached to the belly; limbs free, formed for walking; the anterior not terminating by hands.

Family 6. Insectivora. Plantigrade; no carnivorous teeth; false molars acute; 3 or 4 tuberculous grinders on each side of both jaws; from one to six incisors.

Family 7. Carnivora. Last molar, at least, tuberculous; 2 strong canine, and 6 incisive teeth above and below.

* Plantigrada. ** Digitigrada.

Family 8. Marsupialia. Females with a pouch; both sexes furnished with marsupial bones: hind thumb destitute of nail: opposable; sometimes wanting.

* 2 canines and several small incisors above and below.

** No canine below—at least 6 incisors above.

ORDER IV. Pinnipedia.

Mammæ abdominal; penis attached to the belly: feet very short, covered by a skin formed for swimming, the posterior turned backward.

Family 9. Pinnipedia.

§§ Not more than two kinds of teeth.

ORDER V. Glires.

No canine teeth; incisive 2 below, 2, 4, or 6 above; 22 molar at most; jaws moving horizontally.

* Females with a pouch; both sexes with marsupial bones.

Family 10. Marsupialia.(1) Incisive 2 or 6 above.

** No pouch, no marsupial bones.

† Clavicles distinct omnivorous.

Family 11. Murina.

†† Clavicles rudimental. Herbivorous.

Family 12. Aculeata. Skin covered with prickles; upper incisors 2; toes 4–5.

Family 13. Duplicidentata. Skin covered with hair; upper incisors 4, (6 in young subjects;) toes 5–4.

Family 14. Subungulata. Skin covered with hair; upper incisors 2; molars 16; posterior toes 3 or 5, but lateral each side, very small.

* 5 toed. ** 4–3 toed.

ORDER VI. Bruta.

No canine nor incisor teeth; (except in one genus in which there are 4 below;) from 14 to 98 molars, or none; nails enveloping the extremities of the digits, almost hoop shaped.

---

(1) We scatter the marsupial animals, as naturally they should be separated: their resemblance being merely of analogy and not of affinity, two things often confounded in natural history.

Family 15. Tardigrada. All having teeth; 18 molars at most; no incisors; snout short; limbs much elongated.

Family 16. Effodientia. Some edentous; some having incisors; molars from 26 to 98; snout elongated; limbs well proportioned to the body.

* Incisors and molars. ** Molars. *** No teeth at all.

‡ Ungulata. ‡‡ Vermilinguia.

Section II. Ungulata.

Nails hoof-shaped, covering the last phalanges of the digits: no clavicles; the fore-arm always in a state of pronation.

ORDER VII. Pecora.

Rarely three kinds of teeth; no incisors above; feet didactyle, with two hoofs; the metacarpal and metatarsal bones united; four stomachs; ruminating.

Family 17. Cavicornia. No canine teeth; both sexes having permanent horns, composed of a solid nucleus, growing from the frontal bones, and of an elastic thin case.

* Lacrymatories; nucleus entirely solid. ** No lacrymatories; nucleus cellulous.

Family 18. Devexa. No canine teeth; both sexes with permanent solid horns covered by a skin.

Family 19. Capreoli. No canine teeth; in general the males only having caducous solid, branched horns, covered at least for a time by a hirsute skin.

Family 20. Tylopoda. With canine teeth; hornless.

ORDER VIII. Bellua.

Generally three kinds of teeth; stomach simple; or divided into several pouches, but not for rumination.

Family 21. Solidungula. Feet apparently monodactyle.

FAMILY 22. Fissipedes. Toes 3 or 4, but in the intermediaries approximated; others 4–3 toed.

* Toes 4–3. ** Toes 4–4 *** Toes 2–2.

FAMILY 23. Pachydermata. Feet pentadactyle or tridactyle, the other digits being rudimental; digits only perceived externally, &c.

* Pentadactyla, (Proboscida.) ** Tridactyla.

SUB-CLASS II. BIPEDA.

No hind limbs; (merely indicated by bones.) Fore limbs fins; neck not distinct from the body; body pisciform, terminating in a cartilaginous horizontal fin-shaped tail.

(Live in the water; have no external ears, nor hair on the body.

ORDER IX. CETE.

FAMILY 24. Sirenia. Mammæ pectoral; no blow-holes.

FAMILY 25. Hydraula. Mammæ inguinal; with blow-holes.

ANALYTICAL TABLE

OF THE

NORTH AMERICAN GENERA.

ORDER PRIMATES.

FAMILY BIMANA.

GENUS 1. Homo.

ORDER CHEIROPTERA.

FAMILY CHEIROPTERA.

GENUS 2. Vespertilio.

ORDER FERÆ.

FAMILY INSECTIVORA.

GENUS 3. Sorex. Ears short, rounded.

GENUS 4. Scalops. No external ears: snout simple.

GENUS 5. Condylura. No external ears: snout stellated.

FAMILY CARNIVORA.

Plantigrada. Treading on the whole sole of the foot.

GENUS 6. Ursus. Seven molar on each side: tail short: no anal odoriferous follicules.

GENUS 7. Procyon. Six molars on each side: tail very long, pilous: no anal follicules.

GENUS 8. Meles. Five molars on each side: tail short, pilous: an anal pouch filled with fetid unctuous substance.

GENUS 9. Gulo. Five molars above, six below on each side: tail moderate or short: two folds of the skin near the anus, but no anal pouch.

** *Digitigrada. Treading on the extremities of their digits.*

a. Only one tuberculous behind the upper carnivorous tooth: body much elongated, vermiform: feet short.

GENUS 10. Mustela. Toes cleft: tail moderate and bushy.

GENUS 11. Mephitis. Toes cleft: tail long and bushy or wanting.

GENUS 12. Lutra. Toes palmated.

b. Two tuberculous behind the upper carnivorous tooth.

GENUS 13. Canis. Feet 5—4 toed; nails not retractile: tongue smooth.

c. No small tooth behind the inferior large molar.

GENUS 14. Felis. Feet 5—4 toed: nails retractile: tongue prickly.

FAMILY MARSUPIALIA.

GENUS 15. Didelphis.

ORDER PINNIPEDIA.

FAMILY PINNIPEDIA.

GENUS 16. Phoca. Both jaws furnished with incisive and canine teeth.

GENUS 17. Trichecus. No incisors nor canine below; superior canine greatly prolonged below the lower jaw.

ORDER GLIRES.

FAMILY MURINI.

GENUS 18. Castor. Feet five toed, anterior cleft, posterior palmated; tail wide, depressed, thick, oval, naked and scaly.

GENUS 19. Fiber. Feet five toed, anterior simple, posterior furnished with stiff bristles replacing the membrane; tail compressed, linear, scaly, with scattered bristles.

GENUS 20. Arvicola. Feet simple; tail cylindrical, hairy, grinders without radicles.

GENUS 21. Neotoma. Feet simple; tail cylindrical, hairy; grinders with profound radicles, and with small marked triangles.

GENUS 22. Sigmodon. Feet simple; cylindrical, hairy; molars in each jaw, six, subequal, with radicles, and with deep, alternate folds towards the summit.

GENUS 23. Mus. Feet simple; tail cylindrical, subnaked, scaly, with scattered hairs.

GENUS 24. Gerbillus. Hind feet very long, five toed, each furnished with a distinct metatarsal bone; tail elongated, more or less bushy, but without tuft at tip.

Genus 25. Arctemys. Feet and tail short; nails robust; inferior incisive subulate.

Genus 26. Sciurus. Hind feet turned towards each other; nails very sharp; tail long and bushy; inf. incisive much compressed.

Genus 27. Pertmys. Tail long and bushy; skin of the flanks extended between the fore and hind limbs.

FAMILY ACULEATA.

Genus 28. Hystrix.

FAMILY DUPLICIDENTATA.

Genus 29. Lepus. Hind limbs very long: ears very long: tail short.

ORDER PECORA.

FAMILY CAVICORNIA.

* *Nucleus of the horns solid.*

Genus 30. Antelope.

** *Nucleus of the horns cellular.*

Genus 31. Ovis. Tail destitute of terminal tuft.

Genus 32. Bos. Tail ending in a bushy tuft.

FAMILY CAPREOLI.

Genus 33. Cervus.

ORDER CETE.

FAMILY SIRENIA.

Genus 34. Manatus. Body oblong, ending in an oval, horizontal fin; pectoral fins furnished with rudiments of nails.

Genus 35. Stellerus. Body elongated, ending in a crescent shaped fin; no rudiment of nails.

FAMILY HYDRAULA.

Genus 36. Delphinus. Head proportioned: teeth.

Genus 37. Monodon. Head proportioned: no teeth.

Genus 38. Physeter. Head exceedingly disproportioned: teeth.

Genus 39. Balæna. Head exceedingly disproportioned: teeth cartilaginous, or rather cartilages instead of teeth.

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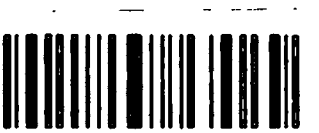
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